BLH ELECTRONICS
Weighing System Electronic Mobile
(MEWS - 747)

CPC-A-2027

OPERATING AND SERVICE MANUAL

THIS MANUAL
APPLIES TO
SPECIAL ORDER
NO. 090-1018

WEIGHING SYSTEM
ELECTRONIC
MOBILE
(MEWS-747)

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42 FOURTH AVENUE, WALTHAM, MASSACHUSETTS 02154
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TM-MEWS-747-2

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PATENT INFORMATION

BLH Equipment is manufactured under one or more of the following patents:

2,771,579	*3,083,689*	*3,405,359*	*3,554,503*
2,815,480	*3,085,847*	*3,434,343*	*3,600,670*
2,846,645	*3,334,352*	*3,434,453*	*3,617,878*
2,932,776	*3,350,927*	*3,438,056*	*3,667,041*

Patented in Canada 1955, 1958, 1960, 1966, 1967, 1968, 1970.

BLH ELECTRONICS,

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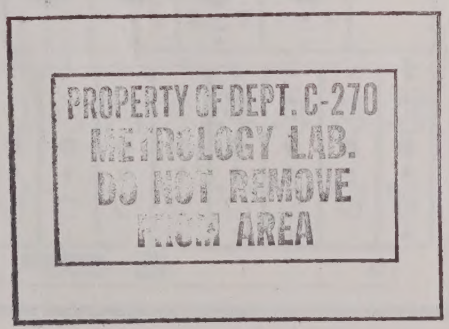
SUPPLEMENTARY DATA
SPECIAL MOBILE ELECTRONIC WEIGHING SYSTEM (MEWS)
BLH 090-1018

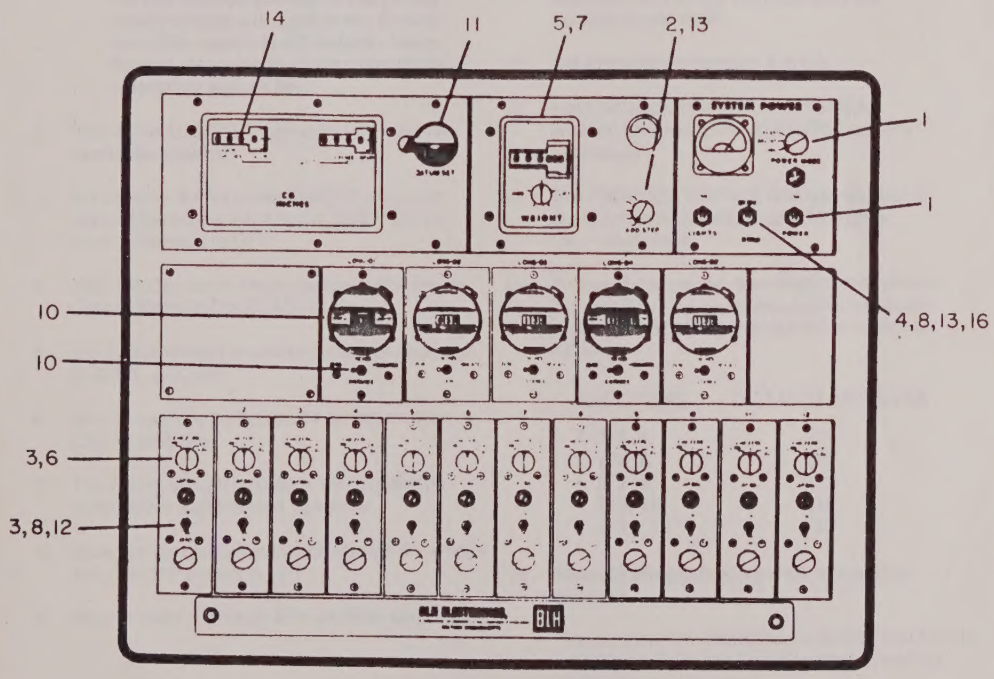
The above sales order covers a special Mobile Electronic Weighing System (MEWS). An operating and service manual for the standard MEWS is attached. The special MEWS system differs from the standard MEWS system in two major respects. First, it provides twelve single-channel weight amplifiers(along with twelve single-channel platform scales) instead of the eight dual-channel amplifiers plus two single-channel amplifiers provided by the standard MEWS. Secondly, it provides five distance amplifiers instead of four. The setup of the special MEWS for weighing a Model DC10-20/30 aircraft is shown in drawing 452621-3. Procedures for system self-check and for aircraft weighing are attached.

REFERENCE DRAWINGS

Special MEWS System Interconnection Diagram 452621-3
Block Diagram, MEWS System 452623-1
MEWS Instrument Mounting Instructions 452625-1
MEWS Instrument Main Assembly Instructions 452624-1
Outline, MEWS Instrument 452622-3



SELF-CHECK



SELF-CHECK

1. Set Power Mode switch on Power Control Panel to source to be used and set Power ON/OFF switch to ON.

CAUTION

Do not change setting of the power mode switch with power on. Check that this switch is off before changing power mode to assure maximum operating switch life.

2. Rotate the ADD-STEP control to the counter-clockwise position.

3. Set Channel #1 Amplifier ON/OFF switch to ON and function switch to CK ZERO. Set all other amplifiers to OFF.

4. Hold the Operation Mode switch on the Power Control Panel in the READ position.

5. The Gross Weight module counter should read 000000, ±50 lbs.

6. Set the function switch on #1 Amplifer to the CK CAL position.

7. The Gross Weight indicator should read as indicated in Calibration Log below.

8. Release the operation switch and set #1 Amplifier ON/OFF switch to OFF.

9. Repeat steps 3 through 8 for all other amplifiers.

10. Set Distance Counter control on Distance Amplifier D1 to 250. Set ZERO-INDICATED switch on D1 to INDICATED. Set D2, D3 D4 and D5 ZERO-INDICATED switches to ZERO.

11. Rotate the DATUM SET control on the CG module until the REFERENCE DATUM counter reads 1000.

12. Set Amplifiers 1 through 4 to ON.

13. Hold the operation switch in the READ position and rotate the ADD-STEP control to balance.

14. The FROM REFERENCE DATUM counter on the CG module should read **875 inches** (±1-1/4 inches).

15. This process can be repeated for the remaining amplifiers by switching in different components and holding the operation switch in READ.

AMPLIFIERS	DISTANCE MODULES
1, 2, 3, 4	D1
1, 2, 5, 6	D2
1, 2, 7, 8	D3
1, 2, 9, 10	D4
1, 2, 11, 12*	D5

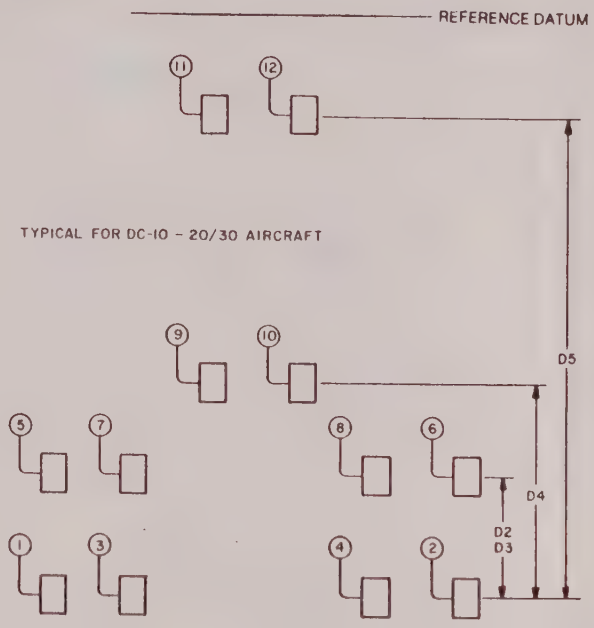
16. Release the operation switch to the STBY position.

*In this step, D5 should be set to 500 and FROM REFERENCE DATUM reading should be 750 inches (±1-1/4 inches).

CALIBRATION LOG

CH. 1		CH. 5		CH. 9			
CH. 2		CH. 6		CH. 10			
CH. 3		CH. 7		CH. 11			
CH. 4		CH. 8		CH. 12			

ACFT, MULTI MAIN



Preliminary: Connect Platform Scales to Channel Amplifier. Level platforms. Connect System to power source if other than internal supply is to be used.

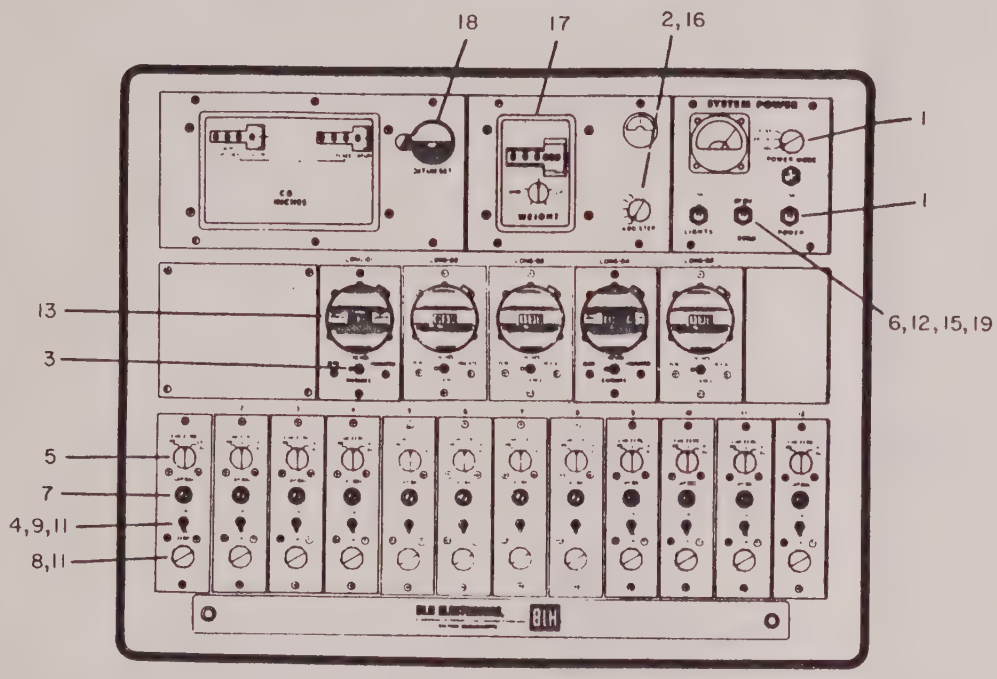
1. Set Power Mode switch on Power Control Panel to agree with source. Set Power ON/OFF switch to ON.

CAUTION

Do not change setting of power mode switch with power on. Check that this switch is off before changing power mode to assure maximum operating switch life.

2. Rotate ADD-STEP control to counterclockwise position.
3. Set the ZERO INDICATED switch on all Distance modules to INDICATED.
4. Set the Channel #1 Amplifier ON/OFF switch to ON. Set all other amplifiers to OFF.
5. Set Channel #1 function switch to the OFF position.
6. Hold the operation mode switch on the Power Control Panel in the READ position.
7. Adjust CAP BAL control on #1 Amp for a null indicator on the panel meter that is as close to zero so as to be within one division-line thickness.
8. Adjust the ZERO control on #1 Amplifier for zero reading on the GW indicator.
9. Set #1 Amplifier ON/OFF switch OFF.
10. Repeat steps 5 through 10 for each amplifier.

ACFT, MULTI MAIN



11. Set each Amplifier ON/OFF switch to ON, one at a time, readjusting the ZERO control, as necessary, to maintain the zero indication on the GW module

12. Release the READ switch on the Control Panel.

13. Measure the distance between the main gear axles. Set this figure into the dials on Distance modules D2 and D3. Measure the distance between the rear main and the center line gear axle. Set this figure into dial of D4. Measure between the rear main axle and the nose gear axle. Set this figure into dial of D5.

14. Tow aircraft to be weighed onto the platform scales..

15. Hold the operation switch at READ.

16. Advance the ADD-STEP switch until the gross weight servo balances as indicated when the panel meter is at the null point.

17. Read Gross Weight directly in Lbs on the GW Counter.*

18. CG is determined by dialing in the distance of reference datum from the rear main gear until that distance is registered on the REFERENCE DATUM counter. Aircraft CG is read directly in inches from the reference datum line on the FROM REFERENCE DATUM counter.

    NOTE: The difference between the counters (REFERENCE DATUM and FROM REFERENCE DATUM) is the distance CG exists forward of the rear main gear midpoint.

19. Release the READ switch.

*Refer to OPERATING NOTES to determine GW and CG when wind is affecting the readings.

OPERATING AND SERVICE MANUAL

WEIGHING SYSTEM
ELECTRONIC
MOBILE
(MEWS-747)

Direct Manual Inquiries to:
Manager, Technical Publications Dept.,
BLH Electronics.

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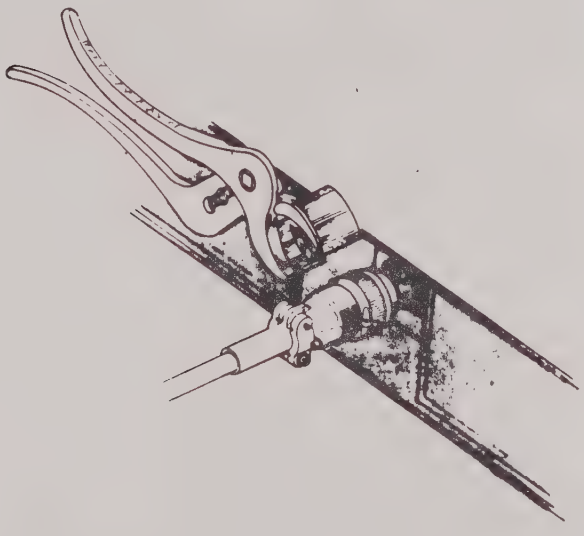
BLH ELECTRONICS, INC.

TECHNICAL MANUAL
MODIFICATION, CHANGE, SUPPLEMENTAL INFORMATION

SUPPLIMENTAL INFORMATION

1. Cable Connector Tool.

A set of connector pliers, BLH part number 417036-2, is provided for use in tightening the connectors in the limited space on the platform scales. Refer to the Figure below for detail. The tool is stored in the cabinet.



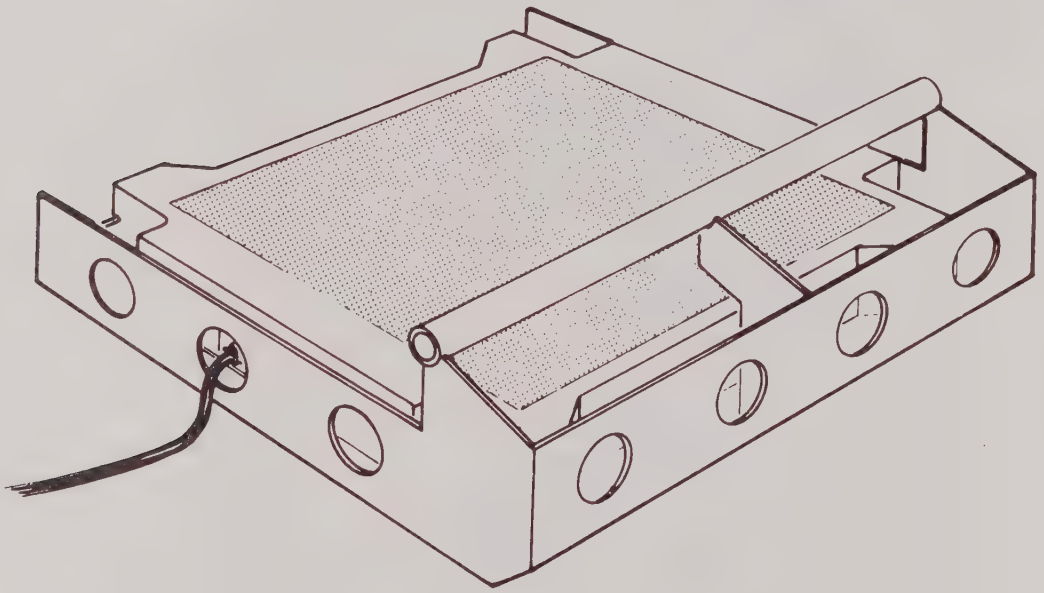
2. Platform Shims.

Aluminum alloy shims have been provided for use in the leveling of the platform scales as described in section III of the manual. The shims are listed below with the corresponding part number. Additional shims can be ordered individually or in sets as indicated by the part numbers.

a.	12" x .031"	p/n 417048-1	set of 6	p/n 417111-1
b.	12" x .064"	p/n 417049-1	set of 10	p/n 417112-1
c.	12" x .125"	p/n 417050-1	set of 10	p/n 417113-1
d.	12" x .190"	p/n 417051-1	set of 6	p/n 417114-1

3. Special Handling.

To minimize the problem of the aircraft rolling off the platform scale while being towed into position, BLH recommends a special cowcatcher type chock. The cowcatcher stop is illustrated in the figure below with platform in position.



4. Adaptor Cables.

An adaptor power cable p/n 417137-1 is included to allow connection to safety type outlets. A 3-wire to 2-wire adaptor p/n 142081-8 is provided for use with 2-wire outlets. These adaptors are illustrated in section II, page 2-4, Figure 2-3.

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION. This manual is written for MEWS 416756-3 and various modifications described in supplements.

1-2. System Description.

1-3. The BLH Mobile Electronic Weighing System (MEWS) consists of an electronic instrumentation module, portable electronic platform scales with ramps and spacers, and trailers for storage and transport of the complete system. Refer to Table 1-1 for number of units included in this System. Typical installation setup time is 4 man-hours. System specifications are listed in Table 1-2.

1-4. Weight and Balance Capability.

1-5. The Mobile Electronic Weighing System is capable of determining the gross weight and longitudinal center of gravity of aircraft, within the limits of the available weighing platforms. Scales and ramps can be positioned as required by the landing gear configuration of the aircraft to be weighed. Dimensions, determined by actual measurement or from previously recorded distances, can be set into the instrument controls in inches and tenths of inches. The reference point for CG computation is the normal reference datum position for aircraft. Gross Weight and Center of Gravity are totalized, computed and displayed on direct reading digital indicators. Capability is also provided for determining wheel or axle weights, before or after GW and CG have been computed. The computed aircraft CG is with respect to the aircraft position from the reference datum.

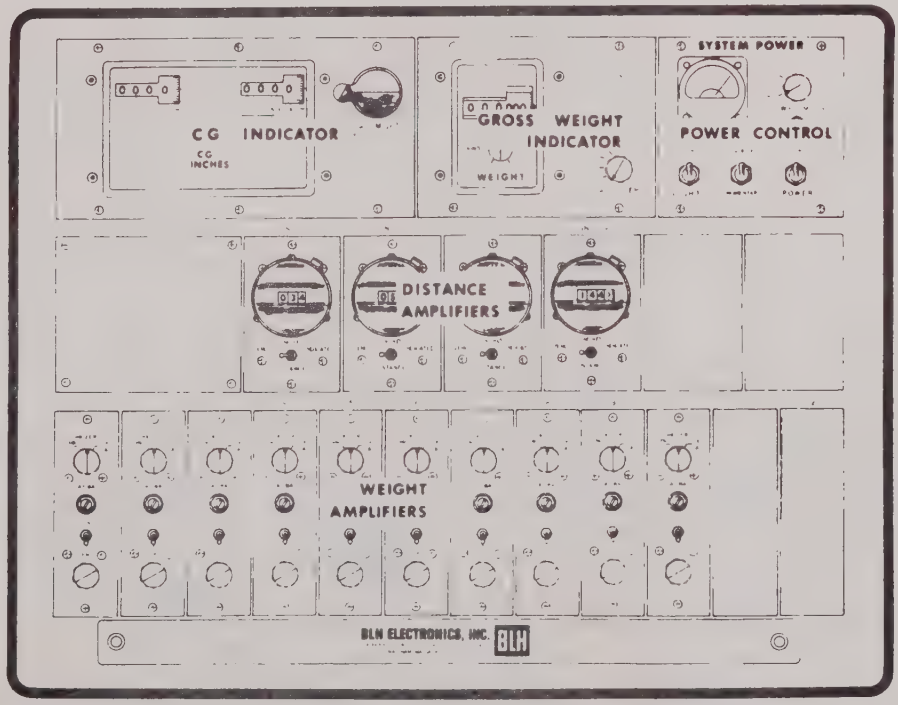


Figure 1-1. Instrument Module

1-6. COMPONENT DESCRIPTION.

1-7. Indicating Instrumentation.

1-8. The Indicating Instrument Module, Figure 1-1, contains the power supply, weight amplifiers, distance amplifiers, servo units, controls and electronic circuitry to operate with up to 18 portable platform scales. The primary function of the instrument is to receive signals from the individual platforms, condition the signal and provide a digital indication of gross weight in pounds and center of gravity in inches from a reference point. The instrumentation is housed within a weatherproof case with a hinged cover to protect the internal components and instrument panels. Lighting is provided to illuminate the instrument panels during night operations. The case is provided with mounting hardware for attaching to the trailer. Handles allow the case to be removed and hand carried. The weight of the instrumentation including case is 52 kgs maximum.

1-9. CHANNEL AMPLIFIERS. Up to 10 channels of AC Operational Amplifiers, Figure 1-2, are used to raise the level of the signal from the platform transducers. A differential input configuration is used to minimize common mode noise problems. Low impedance, single-ended output facilities signal addition. Each channel amplifier can be switched into the System as required for a particular aircraft weighing operation.

1-10. DISTANCE AMPLIFIERS. Four Distance Amplifiers, Figure 1-3, provide the data signal for determining the longitudinal center of gravity. Each distance module provides an output signal that represents the sum of the loads on a pair of platforms (3-4, 5-6, 7-8, 9-10) times the distance of the platform scales from the reference (platform scales 1-2). Each Distance Amplifier is preset with the actual distance of the platform pair from the reference pair.
Distance amplifiers D1 through D3 are identical with a range of 10 to 600 inches. Distance amplifier D4 ranges 20 to 1200 inches.

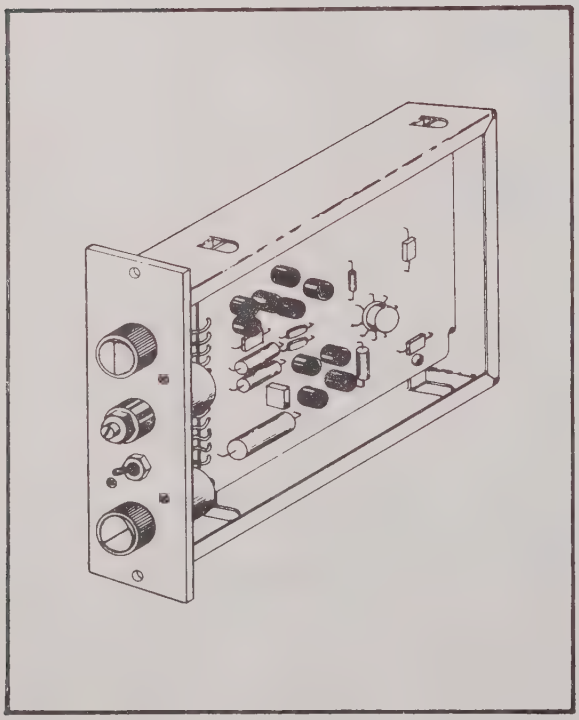


Figure 1-2. Channel Amplifier

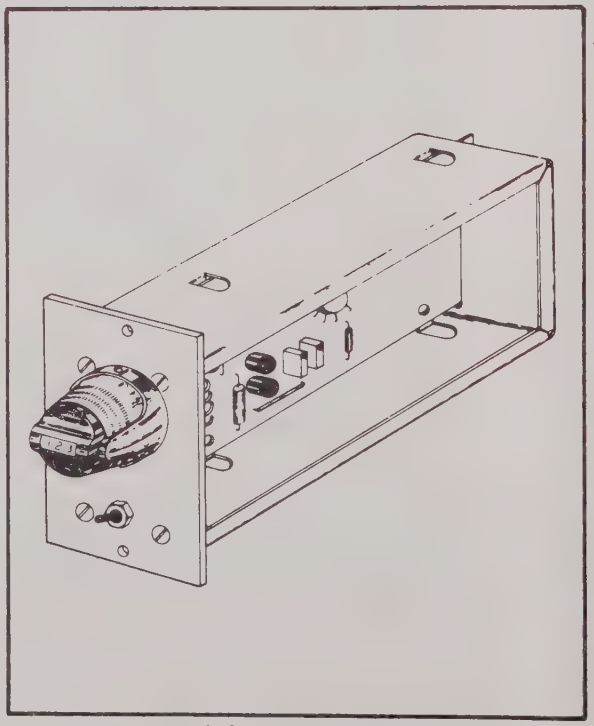


Figure 1-3. Distance Amplifier

1-11. GROSS WEIGHT INDICATOR. The Gross Weight Indicator, Figure 1-4, provides a digital indication of gross weight. The input signal is the sum of the outputs of the channel amplifiers in use. This signal is directly proportional to gross weight and is fed to a servo amplifier which drives the odometer type indicator. Ranges are provided to cover 0 - 900 000 lbs with stepped zero suppression so that each range is divided into nine equivalent intervals of 100 000 lbs.

1-12. In addition to the Gross Weight Indicator, a graduated, uncalibrated dial is included for analog indication of wind effects. The analog dial is used to determine a zero, or minimum, wind condition. A Momentary Read switch on the Power Control Panel is used to lock in the reading at a time coincident to zero wind as noted by the operator's analysis of the analog dial.

1-13. Gross weight readings are taken when the Null Meter dips toward the null point. The Null Meter will remain close to the right hand limit while the system is ranging and dips when the system is in balance.

1-14. CENTER OF GRAVITY INDICATOR. The CG Indicator, Figure 1-5, provides a digital display of the distance in inches that the CG point occurs in respect to a predetermined reference point for aircraft. The input signal for longitudinal CG determination is a function of the Distance Amplifiers. The outputs of the Distance Amplifiers are summed, compared to a reference voltage and the resultant signal used to drive a servo system which is coupled to the indicating dials. Aircraft CG is based upon the aircraft reference datum with respect to the rear main gear. The distance of the rear main gear from the reference datum of the aircraft is preset on the CG module and the CG indicator ranges from the reference datum for the particular aircraft. Wind effect on CG is eliminated using the controls described under GW indicator.

1-15. POWER CONTROL PANEL. The Power Control Panel, Figure 1-6, operates with an internal or external dc voltage (batteries) or from a 115W, 40-440Hz source. Output voltages supply ± 16 Vdc to the instruments, dc power for the servo stages, and 400 Hz for the motor and rate generator. A 400 Hz supply is also provided to excite the platforms and for the instrument reference circuits. Front panel controls provide selection of power source and a meter to monitor the source voltage level.

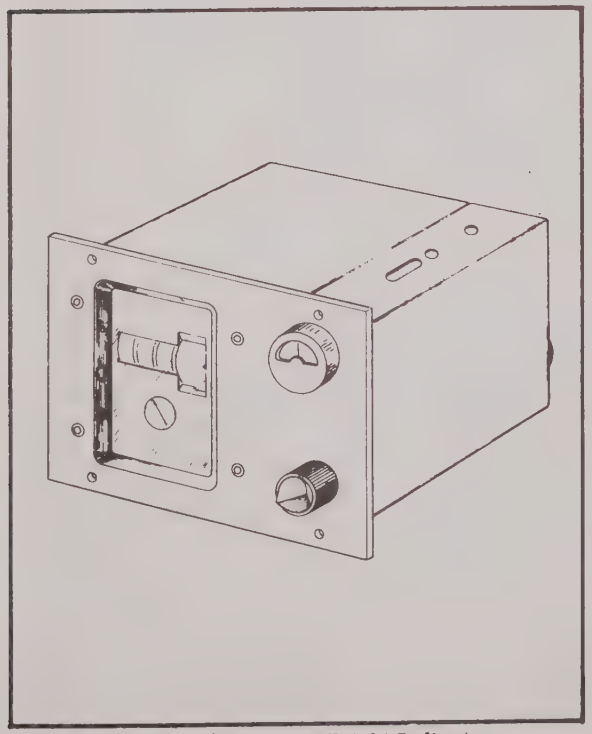


Figure 1-4. Gross Weight Indicator

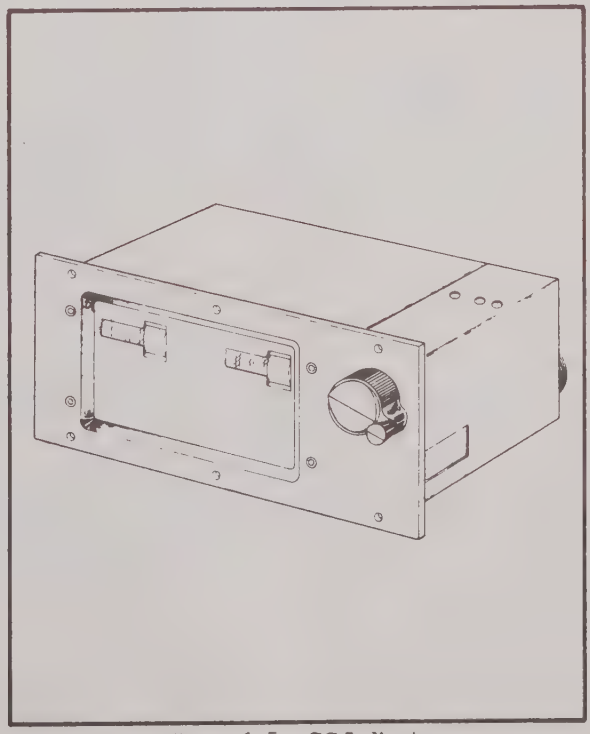


Figure 1-5. CG Indicator

1-16. Weighing Components.

1-17. PLATFORM SCALE. Each platform Scale, Figure 1-7, consists of a self-contained flush-top load supporting structure with integrally mounted load cell transducers and associated wiring. The platform structure is designed for vertical compression loads of up to 50 000 lbs. The upper surface weighing area is defined by an anti-skid coating.

Each scale is also equipped with a non-directional bubble spirit level.

1-18. Four, 25 000 lb capacity, hermetically sealed strain gage transducers are housed in the four corners of the platform assembly. The transducers are individually calibrated and temperature compensated to assure that each platform scale will meet accuracy requirements.

The transducers are supported by adjustable ten-inch diameter pads which distribute the load and permit operation of the scale on uneven surfaces.

1-19. RAMPS AND SPACERS. Structural inclined ramps are provided to allow aircraft to be towed onto the scales for weight and balance operations. Individual aircraft ramps are used. These ramps have a maximum slope of 5°. Spacers have the same general specifications as the ramps. Figure 1-8 shows aircraft ramps and spacers.

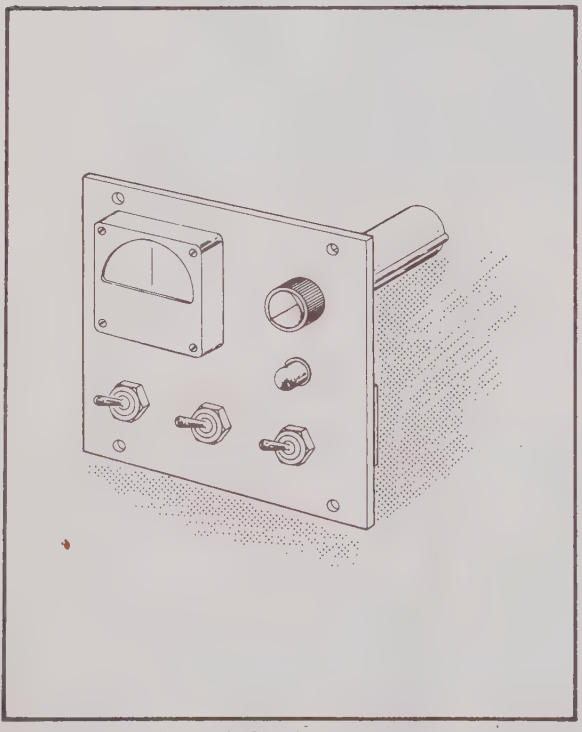


Figure 1-6. Control Panel

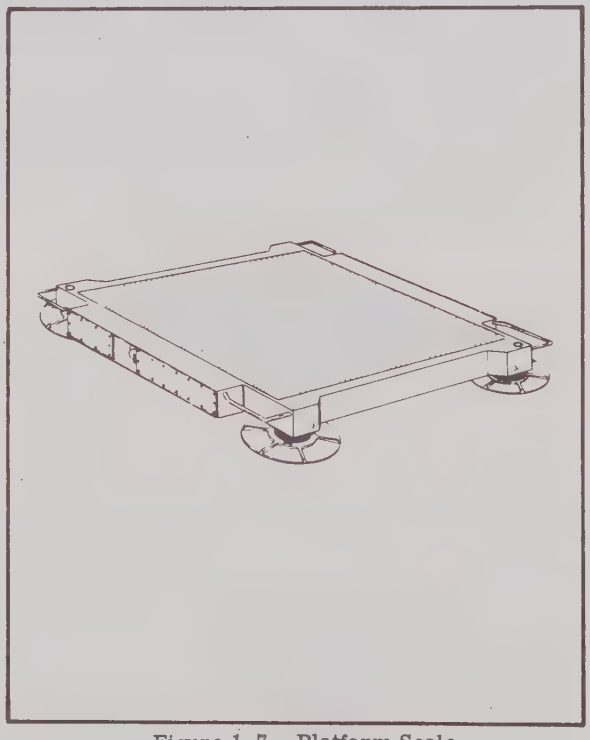


Figure 1-7. Platform Scale

1-20. ACCESSORY EQUIPMENT.

1-21. The Mobile Electronic Weighing System includes:

a. Storage Cabinet - for storing cable, battery, and miscellaneous equipment.

b. Cable Reels - for storing instrument-to-scale interconnecting cables.

c. Trailer Covers - fabric weatherproof covers to protect the system equipment.

d. Cables - two 25-foot external power cables, one two-foot power cable to connect to the internal battery, and ten 125-foot scale connector cables.

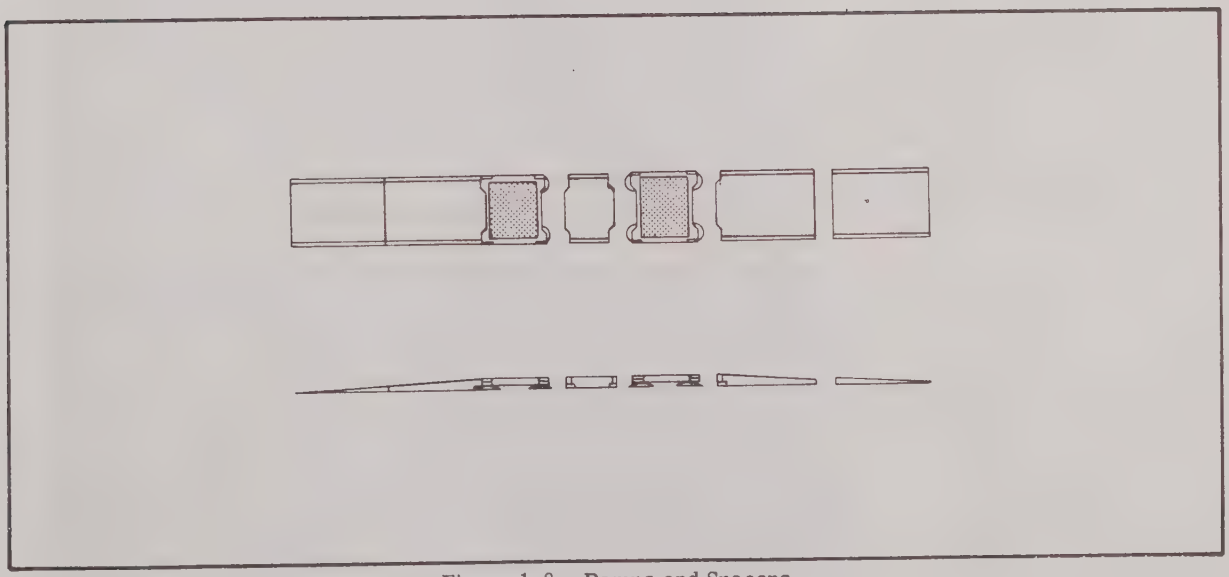


Figure 1-8. Ramps and Spacers

Table 1-1. Specifications

SYSTEM:	
Operating Temperature:	0°F to 120°F (optimum for accuracy 68°F to 86°F).
Storage Temperature:	-65°F to +160°F
Humidity:	Protected during operation against exposure to fungus growth as encountered in tropical areas.
Rain:	Protected for up to 4 inches per hour.
Vibration:	Withstands non-operating vibrations in each of three perpendicular axes from 2 to 50 Hz at 5g with maximum excursions to 0.036".
Electromagnetic Interference:	RFI suppressed.
System Accuracy:	Accuracy of the weight reading, with any number of scales (1 to 18) shall be within ±0.15% of the applied load, or ±175 lbs, whichever is the greater. Accuracy of the center of gravity reading will be ±1.25 inches as measured from a reference datum. Above accuracies are contingent upon the following operating conditions: a. Platforms will be used on a continuously sloped grade not to exceed 0.5 degree. b. Minor variances will occur in this slope due to terrain irregularities and incongruities in the specific area where a platform scale is to be placed. Corrections for these minor variances will be made as follows: 1. Insure ground contact pads are placed in area free from rocks and stones, etc. 2. For best platform performance, the adjustment pad should be turned clockwise (looking down from the top) to the stop, then counterclockwise two (2) turns. The platform calibration can change by 0.05% per turn from the prescribed setting. 3. Level platform by rotating pads as described in page 3-1, paragraph 3-12. c. Platform top surface will be level to within 1/16 inch across length or width of platform. d. The maximum temperature change at the platforms will not exceed ±10°F during the weighing operation. e. Ambient temperature will be within the range of 70°F, ±25°F. If the equipment is used outside this temperature range (45°F -95°F), then system accuracy is decreased by 0.002% of applied load per °F. f. Where platforms and channels have grouping assignment, the correlation of platform(s) to channel amplifier must be maintained. g. The system accuracy is not affected by barometric pressure. h. The system accuracy can be affected by possible variations in gravity between BLH Electronics and Seattle, Washington. The value of "g" at BLH is 980.378 ±0.002cm/sec^2, absolute, and is located at latitude 42°23'10", longitude 71°15'10" and at an elevation of 260 feet above mean sea level. i. Power supplied must be within specification with the meter indicating 22V to 28V, an acceptable voltage level.
Power Requirements;	115V, ±10V, 40 - 440 Hz (single-phase, 3-wire), 25Vdc, ±3Vdc, external source, 25Vdc, ±3Vdc, internal source.

Table 1-1. Specifications (Cont'd.)

AMPLIFIERS:	
Terminal Linearity:	0. 02%
Loop Gain:	250
Gain (temperature coefficient)	0. 05% per 100° F
Output Impedance:	Less than 1 ohm.
GW INDICATOR:	
Range:	0 - 900 000 in 9 steps
Readout:	Digital, with 1/4 inch numbers; odometer type display.
Response Time:	Not more than 10 seconds per interval.
CG INDICATOR:	
Range:	Aircraft: 0 - 500 inches from rear main gear.
Readout:	Digital, with 1/4 inch numbers, odometer type display.
PLATFORM SCALE:	
Capacity	50 000 lbs full scale with safety factor of 1. 5.
Deflection:	0. 5 inch at proof load.
Weight:	115 lbs maximum
Dimensions:	32-1/2" x 36" x 4-3/4" (approximate, depending upon leveling pad adjustment).
Ground Contact Pad:	10-inch diameter with nominal bearing pressure of 100 psi at full scale.
Surface:	Grit anti-skid on weighing area.
Tire Pressure:	325 psi at 50 000 lbs maximum
Load Position:	Any position on scale within the weigh area with safety border of 3 inches wide on the 32-1/2-inch side and 1. 5 inch on the 36-inch side.
AIRCRAFT RAMPS:	
Rated Capacity:	50 000 lbs with safety factor of 1. 5
Deflection:	1/8 inch at 75 000 lbs maximum.
Size:	Two sections assembled - 36 inches x 100 inches, sloped from 4-7/8 inched to 1/8 inch.
Weight:	45 lbs fwd ramp - 75 lbs aft ramp
Surface:	Anti-skid, with entire bottom and first 24 inches of top covered with aluminum.
Bearing Surface:	450 psi ground surface contact, maximum. Maximum tire pressure 325 at 50 000 lbs.

Table 1-1. Specifications (Cont'd.)

AIRCRAFT SPACER:	
Capacity:	50 000 lbs with 1. 5 safety factor
Deflection:	1/8 inch maximum
Size:	30 inches 36 inches x 4-7/8 inches.
Weight:	60 lbs maximum
Surface:	Anti-skid
Tire Pressure:	325 psi at 50 000 lbs
TRAILERS:	
Weight:	#1 Trailer, 880 lbs; #2 Trailer, 780 lbs.
Capacity:	3500 lbs per trailer.
Length:	#1 Trailer, 92 in. ; #2 Trailer, 80 in. ; plus 48 in. for Torque & Pintle.
Width:	Both Trailers 72 in.
Tire Size:	400 x 8
Tire Pressure:	65 psi approx. depending upon load.
Ground Clearance:	16 in.
Turn Radius:	Full Swivel Front Wheels.
Brakes:	Cam Type Hand Brake On Rear Wheels Only.
Tow Speed:	Flight Line Speeds.

SECTION II
INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains information on unpacking, inspection repacking, and installation procedures. Trailer loading is covered in paragraph 2-30.

2-3. UNPACKING.

2-4. When the Electronic Weighing System is shipped crated, care should be taken in handling to prevent damage to the equipment. Remove nails with a nail puller and keep crowbars and levers away from the enclosed units. Save the crate (and internal cartons) for possible future use.

2-5. Visual Inspection.

2-6. Check the instruments for external damage such as broken controls or connectors, and dents or scratches on the panel surface. If the shipping crate or cartons are not damaged, check the cushioning material for signs of severe stress as an indication of rough handling in transit.

2-7. Electrical Check.

2-8. Check the electrical performance of the equipment as soon as possible after receipt. The normal operating process should provide a valid indication of satisfactory performance.

2-9. CLAIMS AND REPACKING.

2-10. Claims for Damage.

2-11. If physical damage is evident or if the system does not function properly when received, notify BLH Electronics, Inc.

2-12. Repacking for Shipment or Storage.

2-13. If units of the System are to be trans-shipped or stored, replace the units in the original shipping cartons and crates, if possible. BLH will provide information and recommendations on materials to be used if the original packaging material is not available or not reusable. Materials should include (1) a double-walled carton, (2) heavy paper or cardboard to protect all instrument surfaces; use extra material around projecting parts of the instrument, (3) at least four inches of tightly packed, shock-absorbing, material surrounding the instrument. Close the cartons securely with heavy paper tape and pack into crates.

2-14. INSTALLATION.

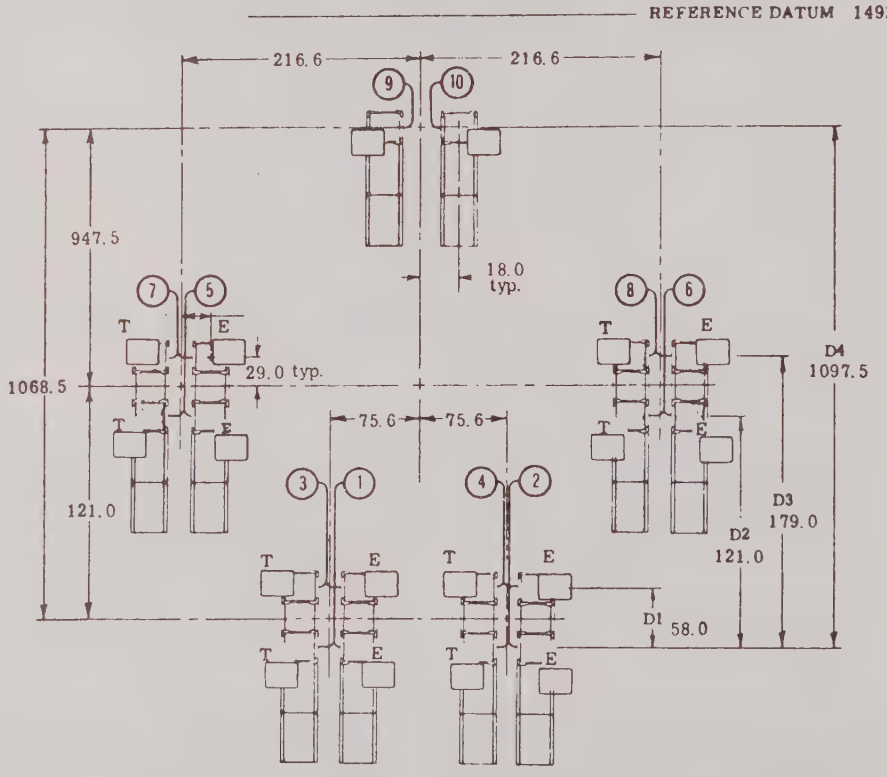
2-15. Location.

2-16. The Mobile Electronic Weighing System can be operated in any indoor location or in the open on a ramp type surface. The System is designed to provide facilities in base strip operations where shelters and handling equipment are not available. The equipment should be located at a centralized point within the limits of the interconnecting cables (125 feet between platform and instrumentation).

2-17. Aircraft Weighing Layout.

2-18. The number and arrangement of platforms, ramps, and spacers to be used in weighing aircraft depends upon the type aircraft. A weighing platform is required for each wheel with an up-ramp (and down-ramp if available). Four-wheel bogies require spacers to bridge the gap between forward and rear wheels. A typical layout configuration is shown in Figure 2-1. Figure 2-2 shows top and side view of one platform and both up-and-down ramps.

SCALE LAYOUT FOR 747 WEIGHT AND CG MEASUREMENT



CABLE COLOR CODE BY CHANNEL

Ch. 1	YELLOW	Ch. 5	WHITE	Ch. 8	AQUA
Ch. 2	RED	Ch. 6	BLUE	Ch. 9	WINE
Ch. 3	GREEN	Ch. 7	BROWN	Ch. 10	BLACK
Ch. 4	BEIGE				

All distance measurements are given in inches.

NOTES: Circled numbers indicate amplifier usage, i.e., (1) to Amp #1, through connector 1J1, etc.
3-digit numbers are platform serial numbers.
E indicates the connector on the end of the 125' cable.
T indicates the connector on the end of the 10' extension.
Make all connections as indicated above relating the platforms by serial number to the cable by connectors and to the amplifiers by channel number.

Figure 2-1. 747 Platform - Cable - Amplifier Assignment

2-19. Power Connections.

2-20. Connect the instrument module to the primary power source using the power cables supplied with the equipment. If ac power is used (220V, 45 to 450 Hz), connect the ac power cable between the ac power receptacle at the back panel of the instrument and the ac power source. If an external dc power source (24-volt battery or dc generator) is used, connect the dc cable to the dc receptacle at the rear panel of the instrument and connect to the source with the connector end or with the adapter cable which is terminated with clips for connecting to a battery. Refer to Figure 2-3 for power cable data.

2-21. Signal Connections.

2-22. Interconnection of the platforms and instrumentation is dependent upon the weighing situation. Refer to the layout in Figure 2-1 and connect the platforms to the amplifiers as indicated by the circled numbers. For aircraft the left rear main gear is the reference point and is always connnected to No. 1 amplifier. Parallel platforms form pairs of weighing points and are connected to adjacent channels of amplifiers, i. e., platforms 1 and 2 are connected to amplifier 1. Use the 125-foot cables provided to make these connections. Note that eight of the cables have dual connectors on the platform end while two cables have single connectors. The single connector cables are for the nose platforms only. Connections to the other instruments, distance amplifiers and indicators, are internal and are made when each of the included units are plugged into the main frame. Figure 2-4 diagrams the signal cables.

IMPORTANT: Dual ended cables must be connected to the live connectors on the platforms when one cable is used with two platforms. The dummy connector on the platforms is opposite the live connector and is recessed into one of the access plates on that side. Live connectors are between access plates and recessed into the platform frame.

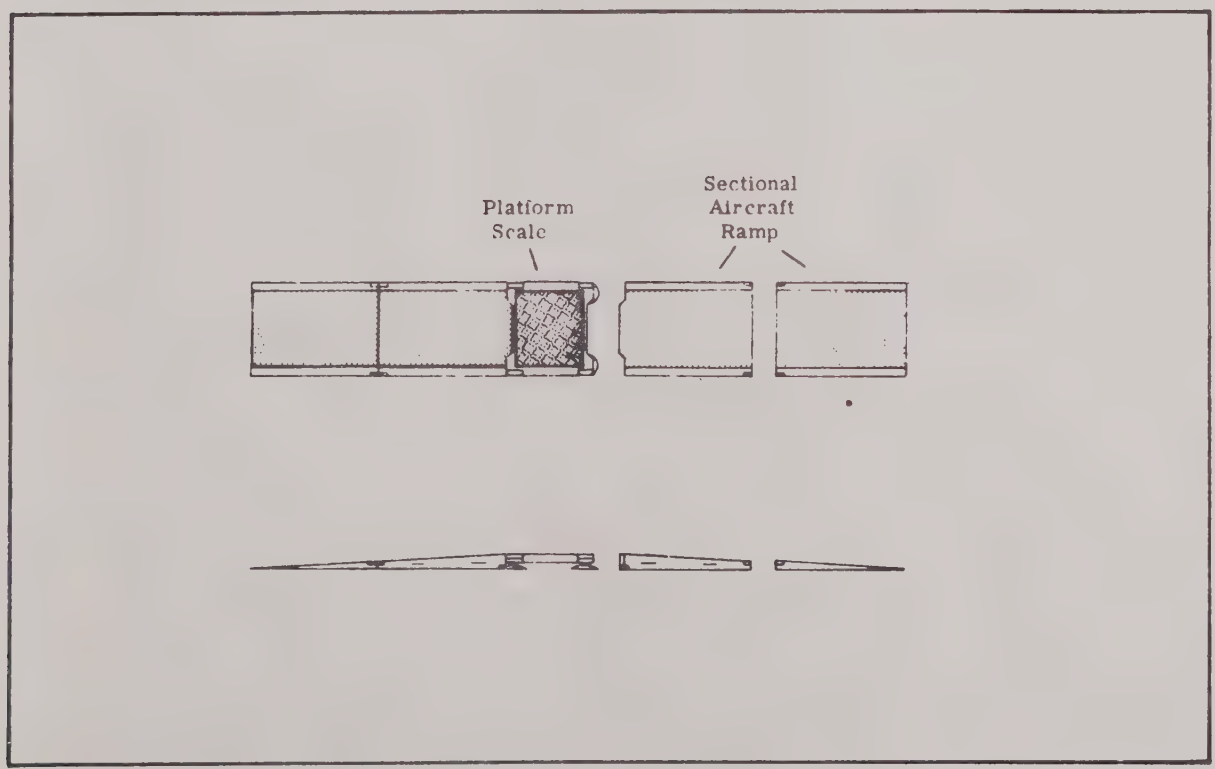
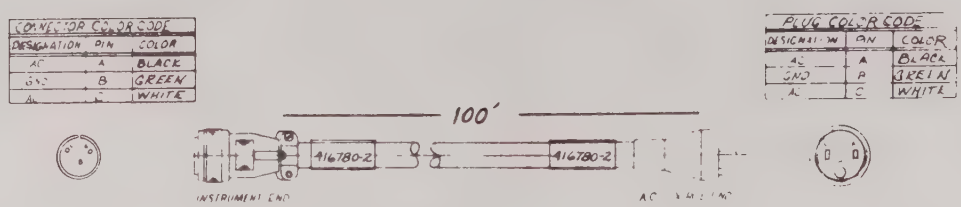
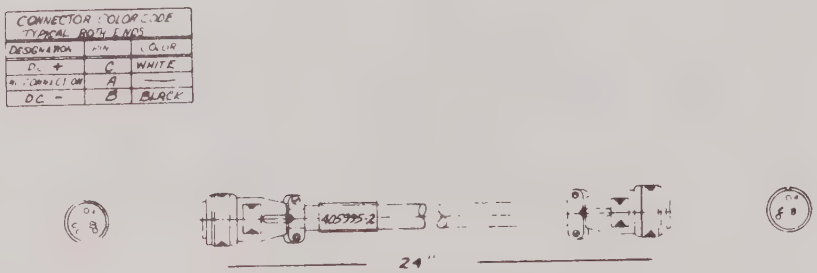


Figure 2-2. Ramp/Platform Layout

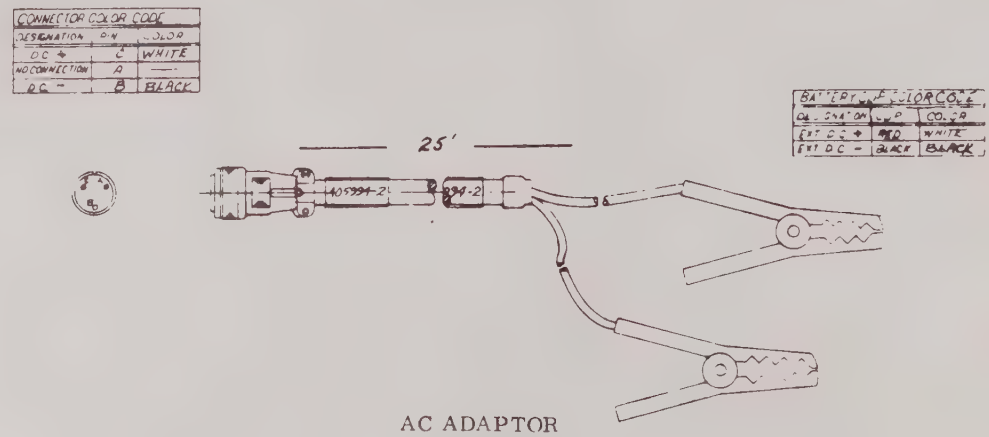
EXTERNAL AC



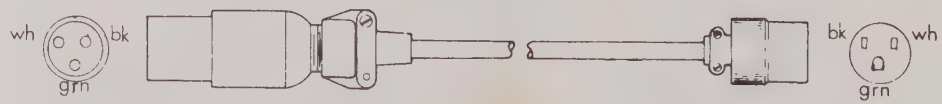
INTERNAL DC



EXTERNAL DC



AC ADAPTOR



ADAPTOR - 3 CONTACT to 2 CONTACT WITH GROUND LEAD

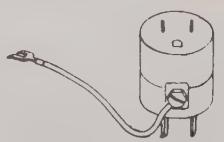
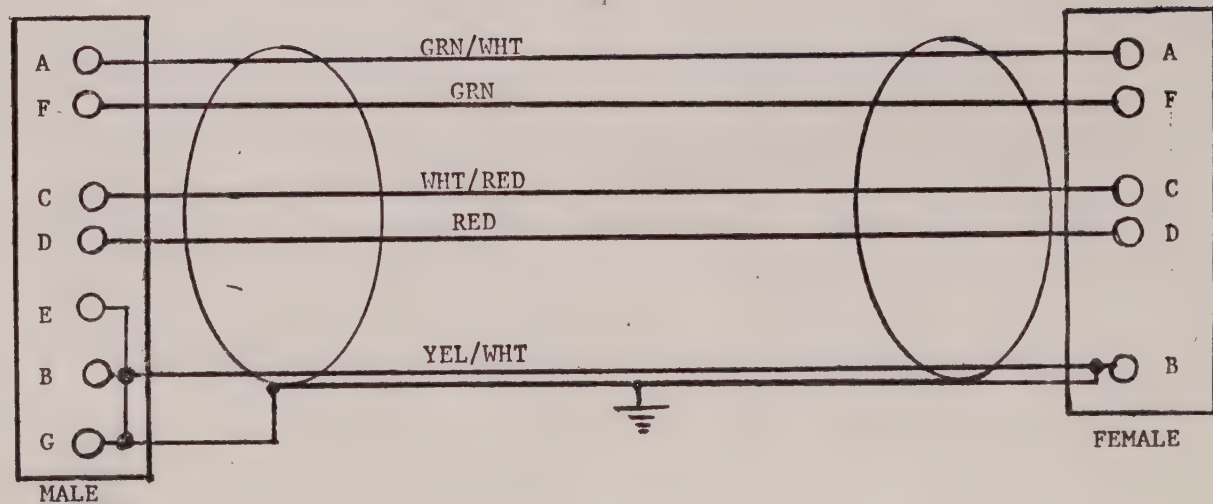


Figure 2-3. Power Cable Drawings.

DESIGNATION	PIN	COLOR
EXT. PWR.	A	GRN/WHT
EXT. PWR.	F	GRN
SIGNAL	C	WHT/RED
SIGNAL	D	RED
TRANSFORMER	B	YEL/WHT
OUTER SHLD	G	

BLH REPLACEMENT SIGNAL

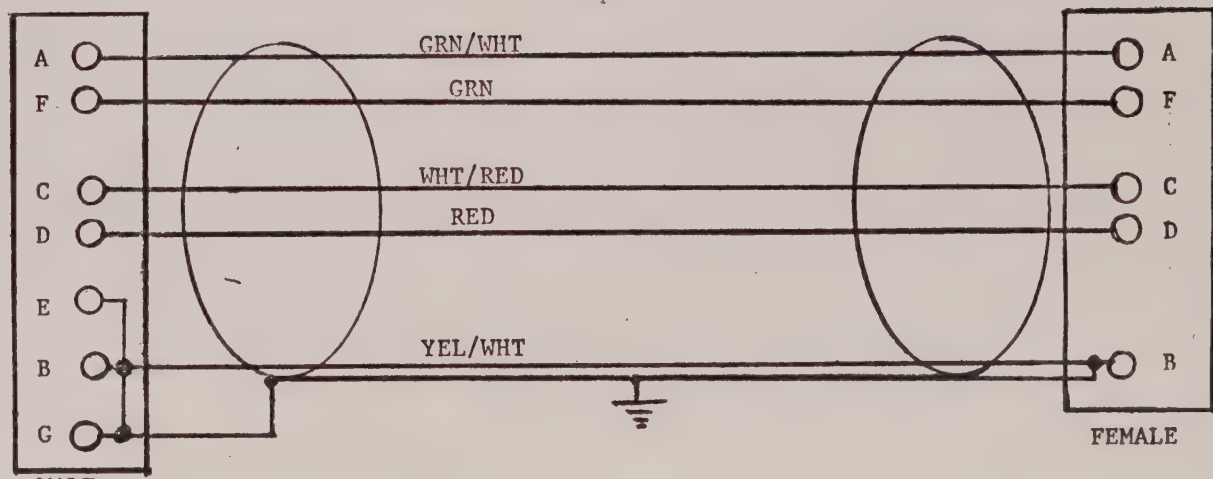
CABLE FABRICATION INSTRUCTIONS



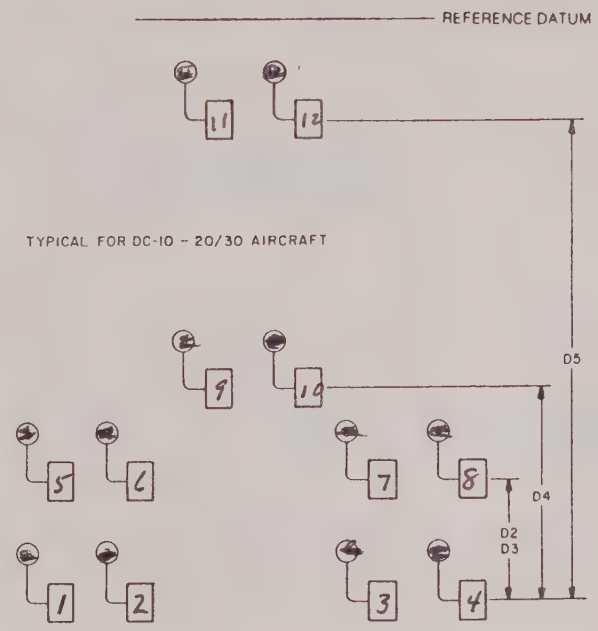
DESIGNATION	PIN	COLOR
EXT. PWR.	A	GRN/WHT
EXT. PWR.	F	GRN
SIGNAL	C	WHT/RED
SIGNAL	D	RED
TRANSFORMER	B	YEL/WHT
OUTER SHLD	G	

BLH REPLACEMENT SIGNAL

CABLE FABRICATION INSTRUCTIONS



ACFT, MULTI MAIN



Preliminary: Connect Platform Scales to Channel Amplifier. Level platforms. Connect System to power source if other than internal supply is to be used

1. Set Power Mode switch on Power Control Panel to agree with source. Set Power ON/OFF switch to ON.

CAUTION

Do not change setting of power mode switch with power on. Check that this switch is off before changing power mode to assure maximum operating switch life.

2. Rotate ADD-STEP control to counterclockwise position.
3. Set the ZERO INDICATED switch on all Distance modules to INDICATED.
4. Set the Channel #1 Amplifier ON/OFF switch to ON. Set all other amplifiers to OFF.
5. Set Channel #1 function switch to the OFF position.
6. Hold the operation mode switch on the Power Control Panel in the READ position.
7. Adjust CAP BAL control on #1 Amp for a null indicator on the panel meter that is as close to zero so as to be within one division-line thickness.
8. Adjust the ZERO control on #1 Amplifier for zero reading on the GW indicator.
9. Set #1 Amplifier ON/OFF switch OFF.
10. Repeat steps 5 through 10 for each amplifier.

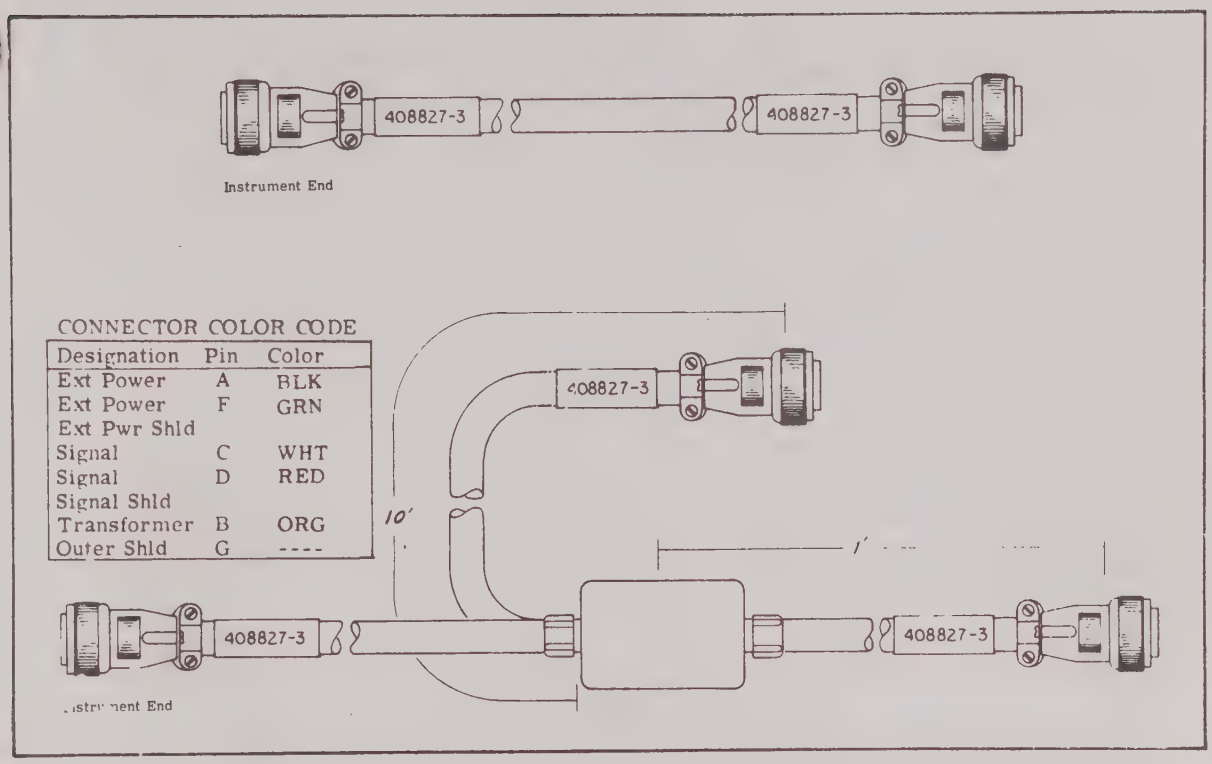


Figure 2-4. Signal Cable Drawing

2-23. Installation Notes.

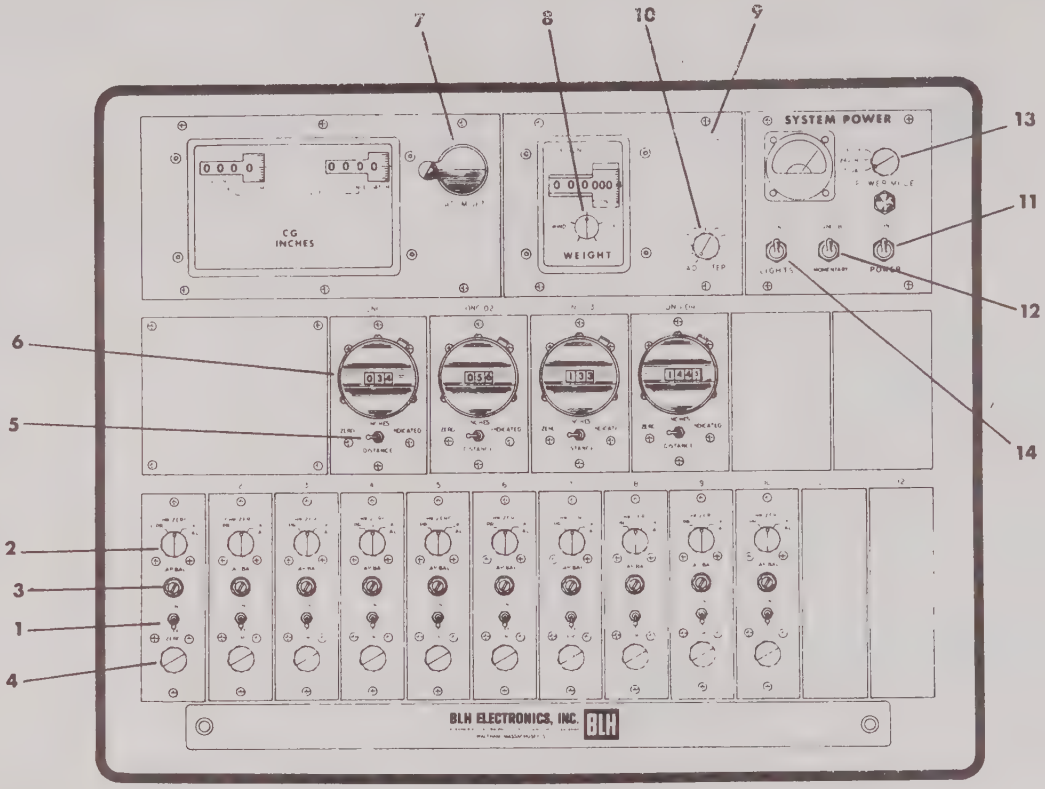
2-24. Use extreme CAUTION when operating from an external dc power source. Do not allow battery clips on the EXTERNAL DC cable to touch the system cabinets to prevent inadvertent damage to the ground circuit wiring inside the instrument.

2-25. If the system has been idle for several days with the cables disconnected, plug and unplug the connectors into the receptacles two or three times before tightening into place. Operate low level signal switches such as those on the weight amplifiers two or three times before leaving in the final position. This will remove insulating film which may have formed on the contacts due to exposure to contaminated atmostphere such as fumes from engine exhaust, fuel, etc. This procedure is particularly important on zero voltage-zero current (dry circuits) such as signal circuits at zero input voltage.

2-26. INITIAL SYSTEM CHECK.

2-27. The following procedures are designed as a check of the System operation after installation and prior to the actual weighing. This check need not be repeated as long as the installation remains intact. Review the installation procedures. Check cables and tighten all connections. Refer to figure 2-5 for control identification data, and Figure 2-6 for connection information.

2-28. Set the Power Mode switch on the Power Control Panel to coincide with the power source (220 Vac, 24 V INT, or 24 V EXT). Set the POWER-ON switch to ON and check the voltage indication on the meter. The 24 Vdc are acceptable if the reading on the indicator is between 22 and 30 volts. Set the ZERO-INDICATED switch on each Distance Amplifier to ZERO. Set all Weight Amplifier ON-OFF switches ON and function switches to CHK ZERO. The Gross Weight counter should read zero (±2 div) with operation switch on the Power Control Panel at READ. The Center of Gravity indication is undefined when no signal is present and the reading is meaningless. Rotate the ADD-STEP control through each position. The GW digital counter should change reading in the most significant figure only, i. e., 100 000, 200 000, 300 000, etc. Set the #1 channel amplifier function switch to the CHK CAL position. The GW counter should read as shown on the calibration log on page 3-5 (±2 div). Set the #1 amplifier ON-OFF switch to OFF. Repeat the CHK CAL function for each amplifier using the check cal figures on page 3-5 (SELF CHECK).



AMPLIFIER

1. ON-OFF. Toggle switch to place amplifier in or out of circuit as required.

2. OPR-CHK ZERO-CHK CAL. Function switch to set the operating mode of the amplifier.

3. CAP BAL. Potentiometer control to compensate for capacitive unbalance in the bridge circuit.

4. ZERO. Potentiometer control to set zero output level of amplifier under zero load conditions.

DISTANCE AMPLIFIER

5. ZERO-INDICATED. Toggle switch to connect output of Distance Amplifier in or out of the circuit as required.

6. INCHES. Potentiometer with digital indicator for setting distance of associated platform from reference platform.

CG INDICATOR

7. DATUM SET. Potentiometer control to preset the reference data for CG determination.

GW INDICATOR

8. WIND LIFT. Pointer indicator to show wind effect as a variation from zero.

9. NULL METER. Meter indicates null point during capacity balance process and operation.

10. ADD-STEP. 9-position switch to set the most significant figure in the indicating counter.

POWER CONTROL

11. ON-POWER. Toggle switch controls input voltage to the system. Indicator light ON when power is applied. Meter indicates voltage level.

12. FUNCTION 2-position toggle switch to control servo. STBY: system quiescent (servo stopped), READ: spring-loaded to return to STBY, servos range while held in READ position, indication freezes when released.

13. POWER MODE. 3-position switch to set System power supply to agree with source voltage to be used. (24V EXT, 24V INT, 115Vac).

14. ON-LIGHTS. Toggle switch controls panel lighting.

Figure 2-5. Front Panel Control Data

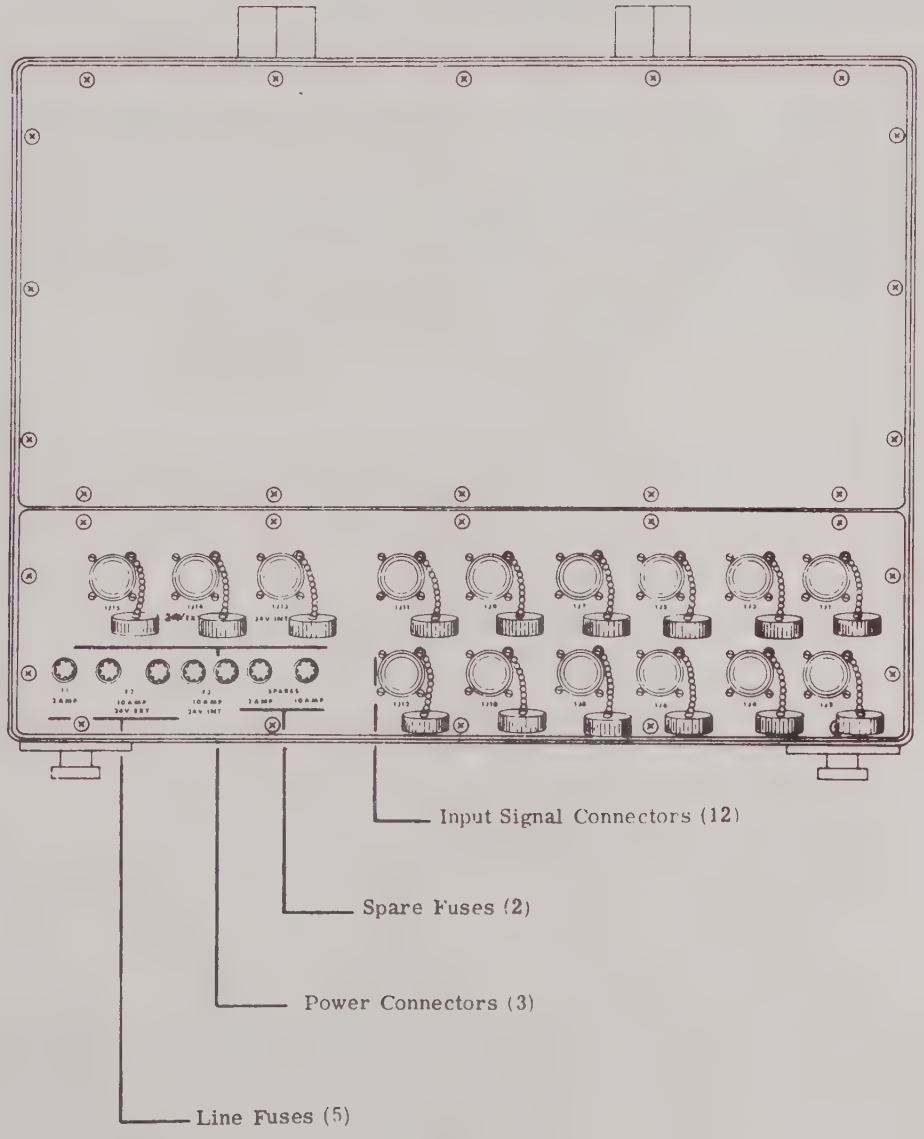


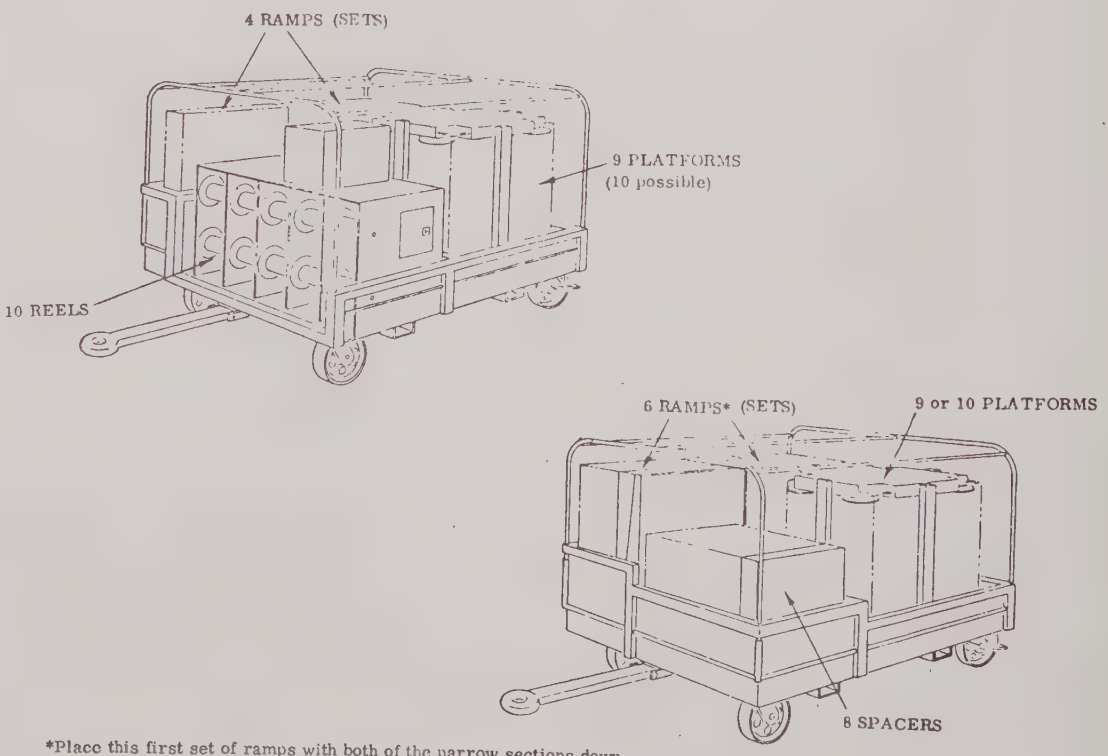
Figure 2-6. Rear Panel Data

2-29. The preceding procedures will serve as a check of the major portion of the System electronics. The intent is to quickly run through a check of each control on each module to see if the indicating devices respond. Accuracy is not being considered since the total system including excitation of the transducers, tare weight, etc., has not been set up for weighing. Precise setting of controls will be discussed under the various operational weighing configurations in Section III, following.

2-30. TRAILER TIE DOWN.

2-31. Trailer Loading.

2-32. The MEWS trailers are designed so that each System component is assigned a specific area for loading. The loading sequence is not critical and the System components can be placed on the trailer(s) as the weighing configuration is disassembled. Refer to Figure 2-7 for outline of each trailer showing storage locations points. When all equipment is loaded, removable panels are replaced and locked. Tie down straps are provided to restrain the equipment. The protective cover should be used whenever the System is not in operation. The cover is provided with tie down straps to secure the cover to the Trailer frame.



*Place this first set of ramps with both of the narrow sections down. The remaining sections can then follow with the narrow section meshed with the wide section of each ramp set. This will provide additional clearance around the lower 1/4 of the ramp length to facilitate unloading. The tie-down straps should be hooked to the center divider before adding components.

Figure 2-7. Trailer Loading (TYPICAL)

SECTION III
OPERATION

3-1. INTRODUCTION.

3-2. Operating procedures in this section assume that all connections and initial adjustments have been made as a part of the installation (preceding Section). System operation is performed entirely at the front of the instrumentation cabinet. Figures 3-4 through 3-5 describe the various operating processes for determination of gross weight and center of gravity for aircraft.

3-3. OPERATING NOTES.

3-4. General.

3-5. The Mobile Electronic Weighing System produces reliable Gross Weight and Center of Gravity readings when the System is set up as described in these instructions. The overall sensitivity of the System depends upon the sensitivity of the transducers, the Channel Amplifiers, Distance Amplifiers and indicating servos. The reliability and accuracy is also a function of the operating process. Scales must be level. The input circuit must be balanced. Accurate measurements must be made between the reference platform and other platforms. These measurement figures must agree with those dialed into the System Distance Amplifiers. Wind effects must also be considered.

3-6. Ground Safety.

3-7. Standard Aircraft ground safety precautions apply. Be sure to stay clear of engine danger areas particularly where the aircraft are being used. Police the area where the system is to be used to remove any objects on the ground that could affect the system functions. The Instrument Module should be located not closer than 35 feet from the aircraft to be weighed.

3-8. Platform Leveling.

3-9. Generally, the operating area selected for use should conform to the surfaces described in the following. Within the described area, select the smoothest portion.

3-10. PAVED. Cement or asphalt surface over hard-packed soil. The top surface may be irregular with elevation variances of 3/4" inches over 8 feet. Depressions may read 3/4" inches over 12 inches. Light sand with small stones to (1/4 inch) may be expected.

3-11. UNPAVED Unpaved surfaces are defined by the California Bearing Ratio (CBR) Test. When considering CBR, the lower the number the softer the surface. The weighing area should be CBR9 which is hard soil capable of handling routine vehicular traffic of large-wheel military vehicles. Typically, a dry football field in the summer would approximate CBR9. The curve drops sharply below this number with the minimum acceptable at CBR4. CBR4 is quite soft and requires a landing mat (pierced steel or aluminum planking) under the platforms. Operating with the scales on the mat will provide a support capability equivalent to CBR 9 to CBR12, or higher.

3-12. Platform leveling is required to maintain system accuracy. A bubble indicator on each platform provides a convenient method of establishing correct platform position. Locate the platforms as required for the weighing operation. Make adjustments as follows:

a. All adjustments start with the pads three turns from the full-out position as defined in the specifications under System Accuracy.

b. For maximum accuracy, limit the adjustment to one-quarter turn in either direction.

c. Where necessary, use 10-inch minimum diameter metal shims (or equivalent) under a pad when the adjustment range is insufficient for leveling.

d. The platform must be absolutely stable. Eliminate rocking by adjusting the pad on the corners that are not solidly touching the ground surface but not more than the allowable adjustment, otherwise use shims.

e. Check the bubble indicator. Adjust pads or shim as required so that the bubble is within the center circle. The platform is considered to be within level tolerances when the bubble indication is as described above. When making adjustments or shimming, check the bubble indicator before each correction.

3-13. Wind Effects.

3-14. Accurate gross weight and center of gravity measurements of aircraft are difficult to make under windy condition. Wind direction and force create lift or pressure that directly affect the weight of the aircraft on the platform scales. The Weighing System is designed to reduce or eliminate wind effect errors. Figure 3-1 shows the effect wind has on the digital Gross Weight Indicator.

3-15. A graduated, uncalibrated dial is included on the Gross Weight module for analog indication of wind. With the Operation mode switch in READ, the GW servo speed is kept as fast as possible and the analog dial relies upon the erratic nature of wind (pulsing, rather than constant velocity and direction) to sense a zero wind condition. Figure 3-2 shows the response on the analog dial for the wind effect error illustrated in Figure 3-1. The dial will apparently come to rest at one point, then move erratically to a high or low for a time, but will then again return to the rest point. This is the zero point or minimum wind. At this time the operator simply releases the Operation mode switch on the Power Supply module to the STANDBY position. The digital indication will be locked in and the reading is then noted. Typically, the operator can determine zero wind and freeze the indicator in 30 seconds. Subsequent wind conditions will not affect the reading until the Operation mode switch is again set to READ.

3-16. Balancing and Calibration.

3-17. The channel amplifiers must be balanced with the associated platform scale(s) to cancel undesired electrical characteristics of the transducers and cables. The Null Meter is used during the balance process. The Meter reading with power ON and all amplifiers OFF is the null point and may not read zero. As each amplifier is turned ON the CAP BAL control is adjusted so that the meter pointer returns as close to the null point as possible. The ZERO control is used to set the amplifier output at zero under no-load conditions. Each channel ZERO can tare out 1500 kgs (approximately). When using these controls remember that capacity balance does not occur at a zero indication on the GW indicator so that this control is adjusted first and then the ZERO control is used to set the exact zero reading on the digital indicator. Also, the meter does not always go to the null point at balance but a definite and clear dip will occur at balance.

3-18. The System has been calibrated at the factory and will not require recalibration except as a result of repair or replacement. The internal adjustments require special equipment and are covered in Appendices A and B. Use the SELF-CHECK process in Figure 3-3 to verify the calibration prior to each operating period and whenever the weighing configuration changes. Recalibration or certification of calibration is recommended on a periodic basis, not less frequently than once annually.

3-19. Zero Suppression.

3-20. The ADD-STEP control on the Gross Weight module provides five discrete zero suppression steps to increase the range of the GW digital counter. The zero suppression steps are precalibrated and affect only the most significant figure in the digital readout. The servo circuit will not balance until the ADD-STEP switch is set at the required range. From the counterclockwise extreme, each position allows the servo to range as follows:

98 000 to 102 000
98 000 to 202 000
198 000 to 302 000
298 000 to 402 000
398 000 to 502 000

The lower figure is the stop point coming down from the clockwise extreme. It is important to recognize, from the dip on the null meter and where the counter stops, when the ADD-STEP control is set at the correct range. The counter should drive upscale as the ADD-STEP control is advanced from the counterclockwise position until the correct value is reached and when the ADD-STEP is rotated beyond that point, the counter will reverse direction and count back to the correct value (or to the stop point for that range).

3-21. Aircraft Weighing.

3-22. It is not necessary to measure distances between landing gear wheels prior to weighing. Pull the aircraft into the weighing area, assemble the ramps and platforms directly in front of the wheels, then tow the aircraft onto the scales. The nose wheel platform layout may have to be put in place as the aircraft progresses depending upon the size of the towing tractor. After the weighing operation the distances to be used for CG should be measured with the tape measure. This information can be found in the weight and balance data for the aircraft but very often the dimensions have changed, due to hard landings, etc. High oleo struts for main gear and bleed of knee-type nose wheels directly influence the absolute distances for a given aircraft. When extreme accuracy is desired, plumb bob the aircraft to locate the reference datum line. Then make all measurements from the reference datum to the nose wheel and main gear.

3-23. Wherever possible the aircraft layout should locate the aircraft heading into the wind. This attitude will prevent cross wind loading of one side. Wind will affect the wings equally and more accurate weight and balance determinations can be made.

3-24. The Mobile Electronic Weighing System can be used to check the accuracy and validity of integral weight and balance systems. This process requires the absolute measurements described in 3-22. Each wheel must be centered on a scale. This requires an exact layout, based upon measurements, prior to towing the aircraft onto the scales.

3-25. **Whenever dual-ended cable is used with a single main gear platform (channels 1-8)** both cable connectors must be **connected to the single platform. Two matching connectors are provided on the platform for this purpose. The input to the Weight Amplifier is thus the same for one platform as for two. However, when the dual-ended cable is used at nose gear platform (channel 9 and 10) the dummy connector is not used. Wrap unused cable connector in plastic for protection.**

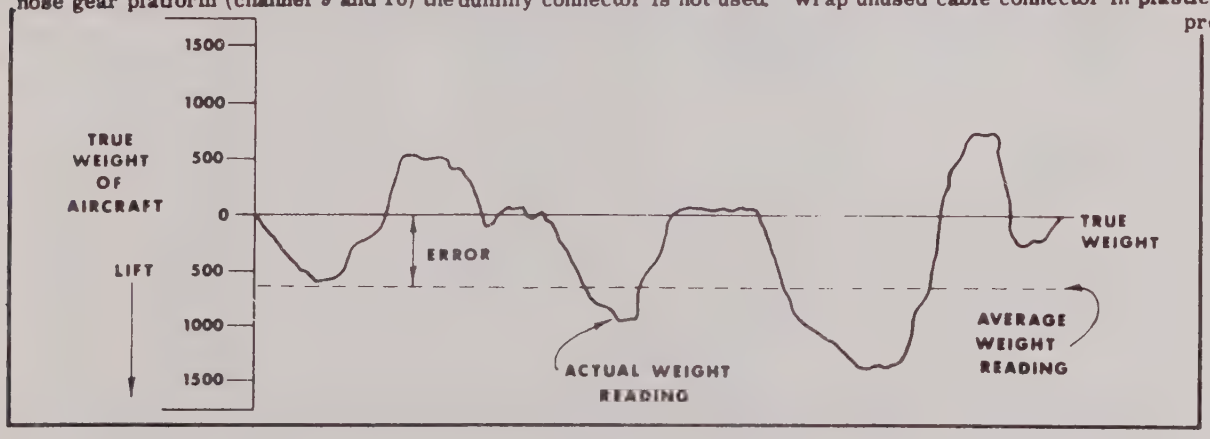


Figure 3-1. Wind Effect Error

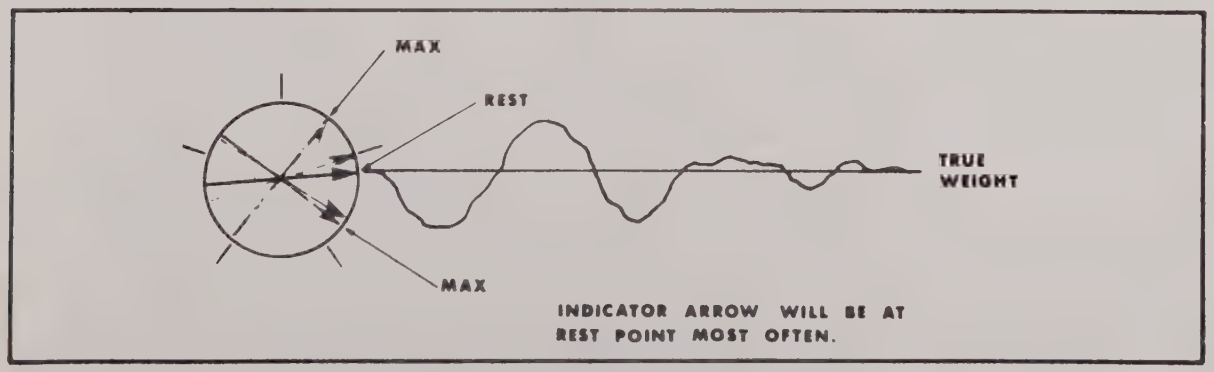


Figure 3-2. Analog Wind Indicator

SELF-CHECK

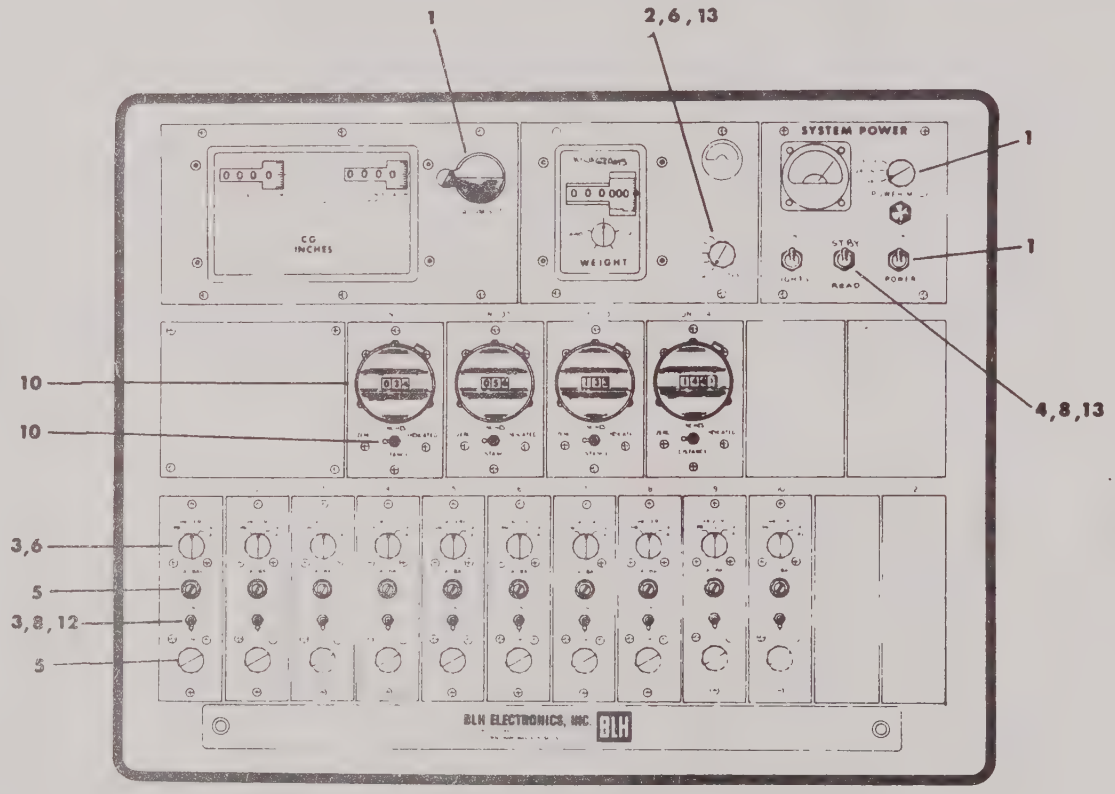


Figure 3-3. System Self-Check

SELF-CHECK

1. Set Power Mode switch on Power Control Panel to source to be used and set Power ON/OFF switch to ON.

CAUTION

Do not change setting of the power mode switch with power on. Check that this switch is off before changing power mode to assure maximum operating switch life.

2. Rotate the ADD-STEP control to the counter-clockwise position.

3. Set Channel #1 Amplifier ON/OFF switch to ON and function switch to CK ZERO. Set all other amplifiers to OFF.

4. Hold the Operation Mode switch on the Power Control Panel in the READ position.

5. The Gross Weight module counter should read 000000, ±50 lbs.

6. Set the function switch on #1 Amplifer to the CK CAL position.

7. The Gross Weight indicator should read approx. 74 000 lbs (for channels 1 thru 8, and approx. 39 800 lbs for channels 9 and 10). Actual numbers are recorded in Calibration Log below.

8. Release the operation switch and set #1 Amplifier ON/OFF switch to OFF.

9. Repeat steps 3 through 8 for all other amplifiers.

10. Set Distance Counter control on Distance Amplifier D1 to 250. Set ZERO-INDICATED switch on D1 to INDICATED. Set D2, D3 D4 ZERO-INDICATED switches to ZERO.

11. Rotate the DATUM SET control on the CG module until the REFERENCE DATUM counter reads 1000.

12. Set Amplifiers 1 through 4 to ON.

13. Hold the operation switch in the READ position and rotate the ADD-STEP control to balance.

14. The FROM REFERENCE DATUM counter on the CG module should read 875 inches (± 1-1/4 inches).

15. This process can be repeated for the remaining amplifiers by switching in different components and holding the operation switch in READ.

AMPLIFIERS	DISTANCE MODULES
1, 2, 5, 6	D2
1, 2, 7, 8	D3
1, 2, 9, 10*	D4

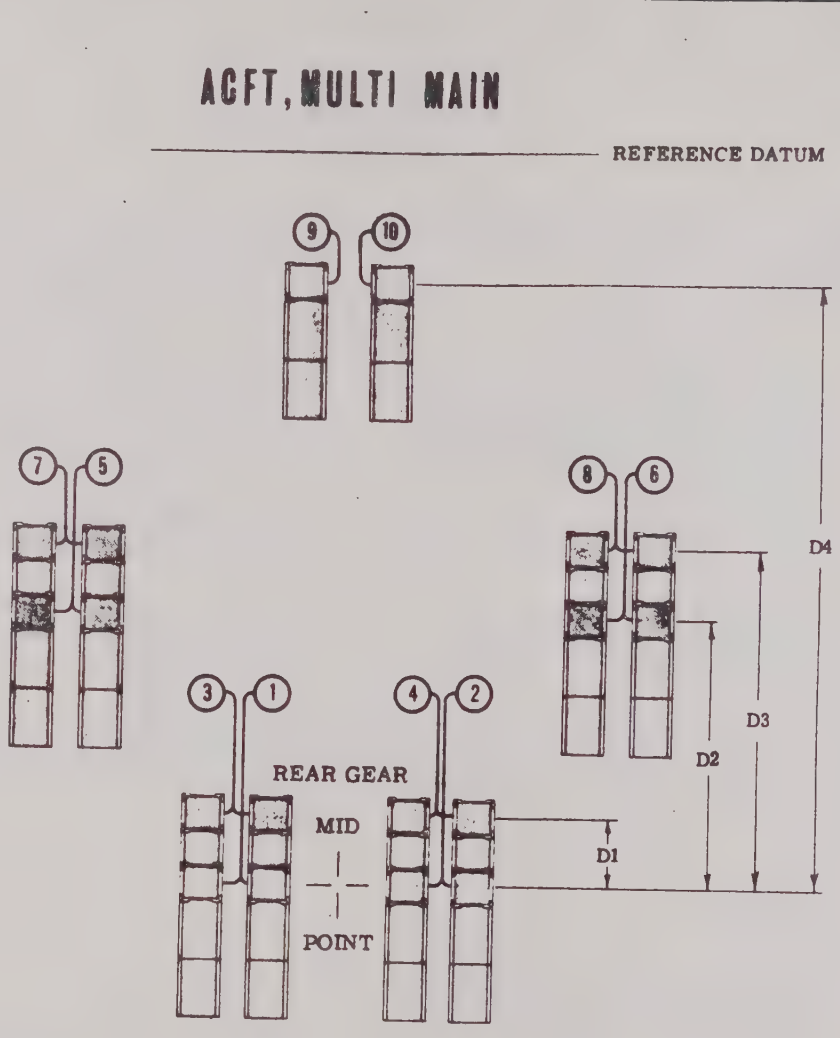
16. Release the operation switch to the STBY position.

*The reading in step 14 for this combination will be 912.5 inches ± 1-¼ inch.

CALIBRATION LOG

CH. 1		CH. 5		CH. 9			
CH. 2		CH. 6		CH. 10			
CH. 3		CH. 7					
CH 4		CH. 8					

Figure 3-3. System Self-Check (Cont'd.)



Preliminary: Connect Platform Scales to Channel Amplifier. Level platforms. Connect System to power source if other than internal supply is to be used.

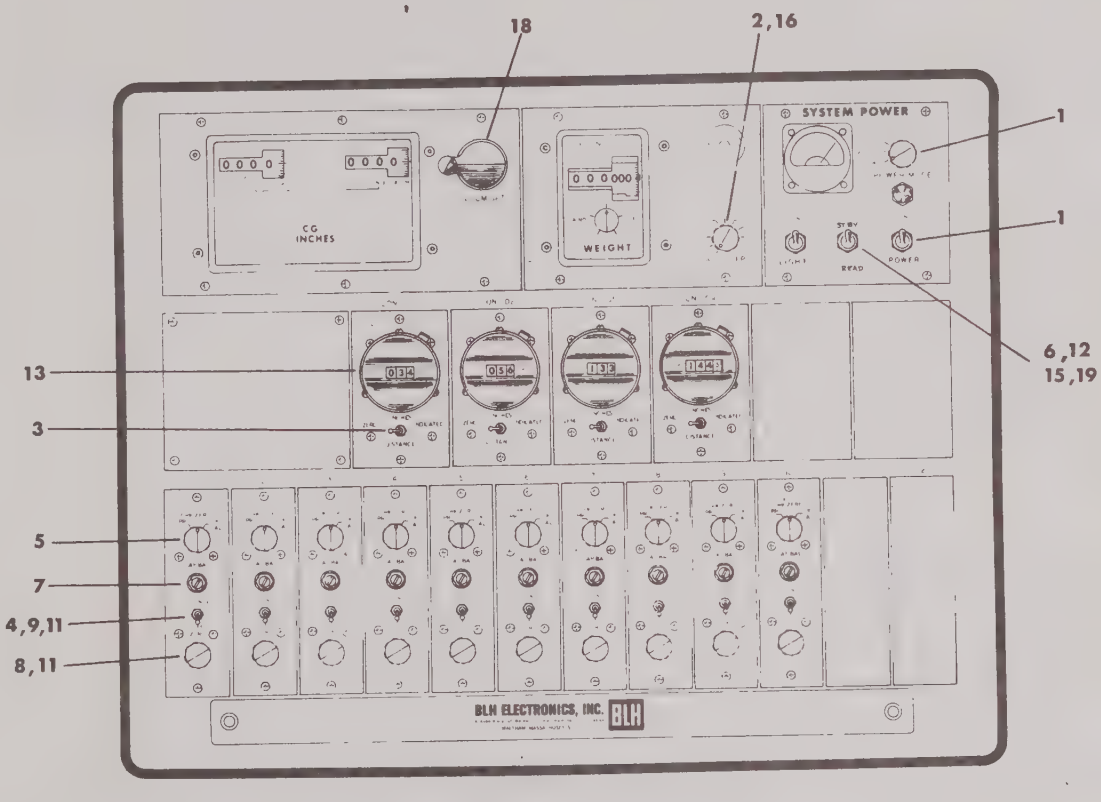
1. Set Power Mode switch on Power Control Panel to agree with source. Set Power ON/OFF switch to ON.

> CAUTION
>
> Do not change setting of power mode switch with power on. Check that this switch is off before changing power mode to assure maximum operating switch life.

2. Rotate ADD-STEP control to counterclockwise position.
3. Set the ZERO INDICATED switch on all Distance modules to INDICATED.
4. Set the Channel #1 Amplifier ON/OFF switch to ON. Set all other amplifiers to OFF.
5. Set Channel #1 function switch to the OPR position.
6. Hold the operation mode switch on the Power Control Panel in the READ position.
7. Adjust CAP BAL control on #1 Amp for a null indicator on the panel meter that is as close to zero so as to be within one division-line thickness.
8. Adjust the ZERO control on #1 Amplifier for zero reading on the GW indicator.
9. Set #1 Amplifier ON/OFF switch OFF.
10. Repeat steps 5 through 10 for each amplifier.

Figure 3-4. Operation With Multiple Main Gear Aircraft

ACFT, MULTI MAIN



11. Set each Amplifier ON/OFF switch to ON, one at a time, readjusting the ZERO control, as necessary, to maintain the zero indication on the GW module.

12. Release the READ switch on the Control Panel.

13. Measure the distance between the body gear axles. Set these figures into the dial on Distance modules D1. Measure between rear body and rear wing gear. Set this figure into dial on D2. Measure between rear body and forward wing gear. Set this figure into D3. Measure between rear body and nose. Set this figure into D4.

14. Tow aircraft to be weighed onto the platform scales.

15. Hold the operation switch at READ.

16. Advance the ADD-STEP switch until the gross weight servo balances as indicated when the panel meter is at the null point.

17. Read Gross Weight directly in lbs on the GW Counter. *

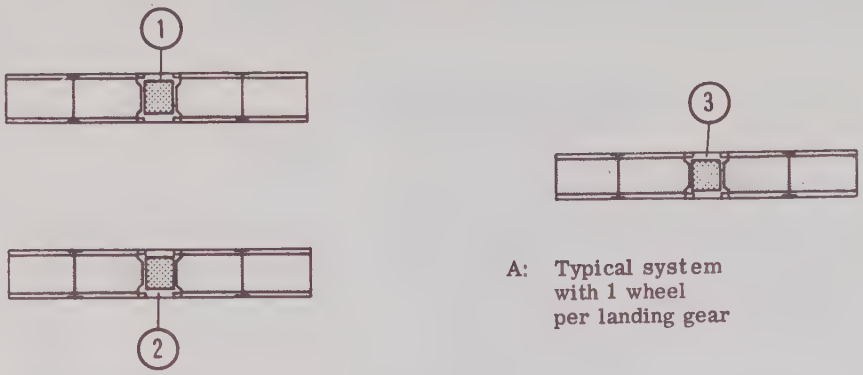
18. CG is determined by dialing in the distance of reference datum from the rear body gear until that distance is registered on the REFERENCE DATUM counter. Aircraft CG is read directly in inches from the reference datum line on the FROM REFERENCE DATUM counter.

    NOTE: The difference between the counters (REFERENCE DATUM and FROM REFERENCE DATUM) is the distance CG exists forward of the rear body gear midpoint.

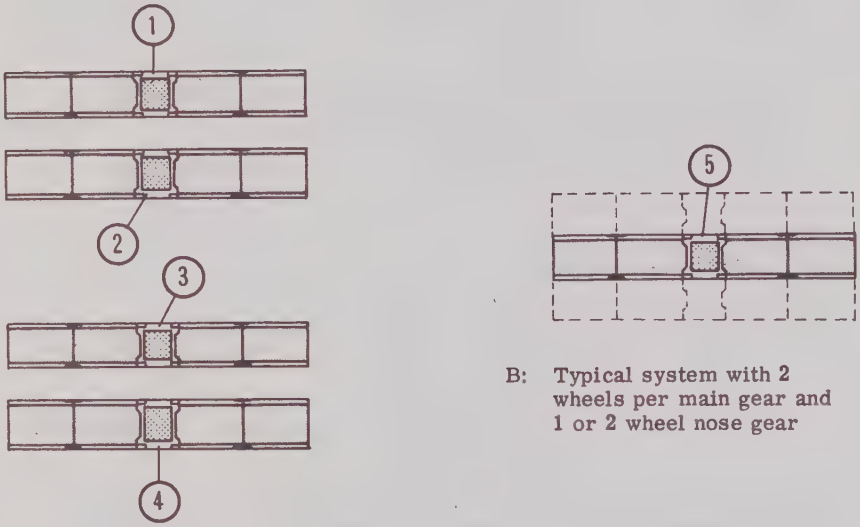
19. Release the READ switch

*Refer to OPERATING NOTES to determine GW and CG when wind is affecting the readings.

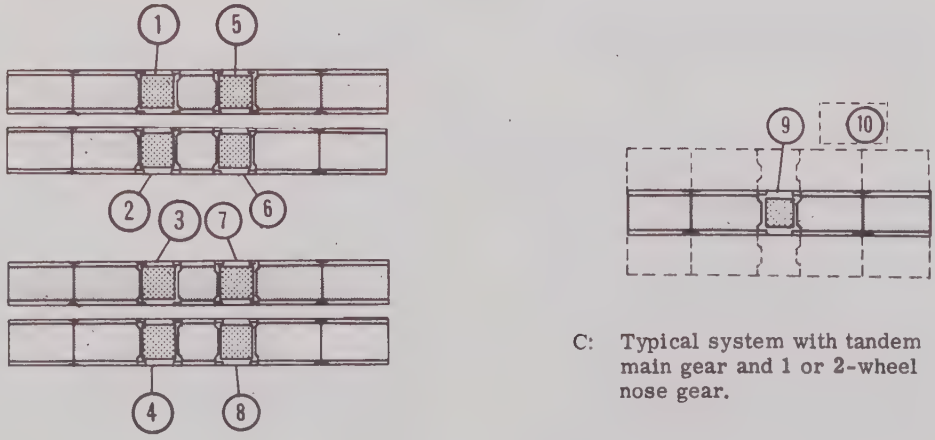
Figure 3-4. Operation With Multiple Main Gear Aircraft (Cont'd.)



A: Typical system with 1 wheel per landing gear



B: Typical system with 2 wheels per main gear and 1 or 2 wheel nose gear



C: Typical system with tandem main gear and 1 or 2-wheel nose gear.

Circled No's indicate amplifier usage, i. e. ①to Amp #1. etc.
NOTE: Weighing configurations above will provide accuracies to 0.35% of applied load or 175 lbs, whichever is greater.

Figure 3-5. Typical Aircraft Weighing Configurations

SECTION IV
PRINCIPLES OF OPERATION

4-1. SYSTEM CONCEPT.

4-2. The design of the MEWS System is based upon the schematic representation of the 12-platform configuration shown in Figure 4-1. Instrument design is based upon the ac-ratio technique where the transducer and reference circuitry are both excited from a common ac voltage source. Wide variations in excitation voltage thus have negligible effect on system accuracy.

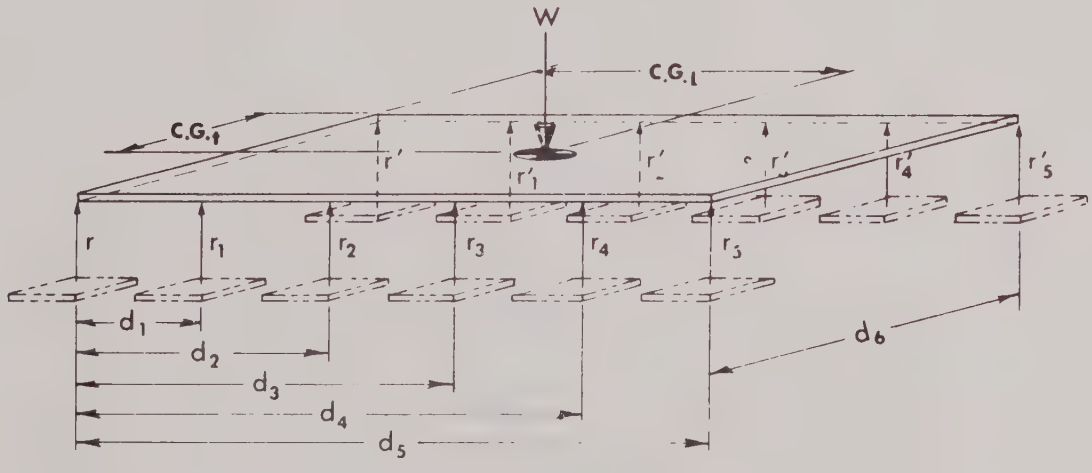
4-3. Based upon Figure 4-1 the weight and center of gravity equations are:

$$\text{Weight} = r + r' + r1 + r1' + r2 + r2' + r3 + r3' + r4 + r4' + r5 + r5'$$

$$CG_L = \frac{d1(r1 + r1') + d2(r2 + r2') + d3(r3 + r3') + d4(r4 + r4') + d5(r5 + r5')}{W}$$

$$CG_T = \frac{d6(r' + r1' + r2' + r3' + r4' + r5')}{W}$$

These equations represent the weight and CG locations for the general case.



Where:

r, r', r_1, r_1', r_2, etc. = Reactions measured by individual platforms

d_1, d_2, d_3, d_4, d_5, d_6 = Distance of reactions from reference point

W = Total weight applied to platform configuration

C. G. $_L$ = Distance of center of gravity from the reference in the longitudinal direction.

C. G. $_T$ = Distance of the center of gravity location from the reference in the transverse direction.

Figure 4-1. Design Concept For Platform Weighing System.

4-4. Aircraft CG is based upon a slightly different equation. Refer to Figure 4-2. In this case the gross weight equation is:

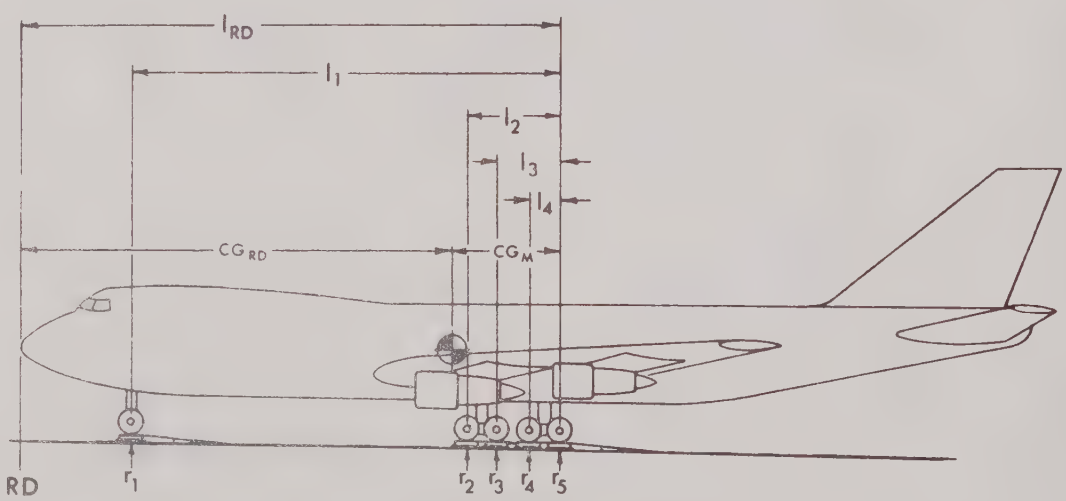
$$\text{Weight} = r1 + r2 + r3 + r4 + r5$$

The reactions r2, r3, r4, r5 represent the total reaction supported by main gear. The CG location with respect to the rear main gear is determined by the equation:

$$CG_M = \frac{r1I_1 + r2I_2 + r3I_3 + r4I_4}{W}$$

and the location of the CG point from the Reference Datum is:

$$CG_{RD} = I_{RD} - CG_M$$



Where:

RD = Reference Datum
r_1 = Nose Gear Reaction
r_2, r_3 = Wing Gear Reaction
r_4, r_5 = Body Gear Reaction
W = Aircraft Gross Weight
CG_M = Distance of center of gravity location from rear body gear
CG_{RD} = Distance of center of gravity location from reference datum
I_{RD}, I_1, I_2, I_3, I_4, I_5 = Distances of reactions and reference datum from rear body gear

Figure 4-2. Design Concept for Aircraft Weighing

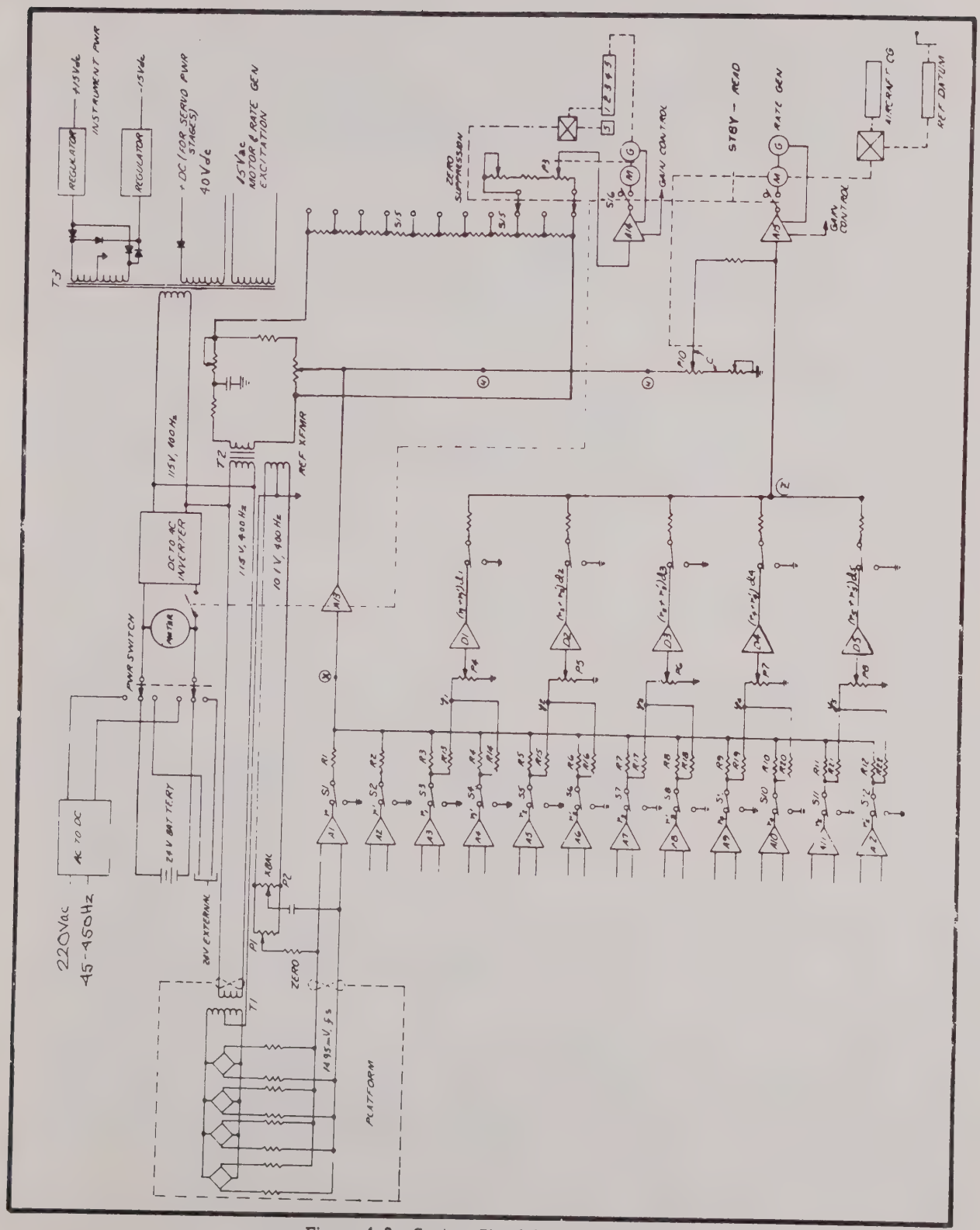


Figure 4-3. System Simplified Schematic

4-5. Transducer Addition.

4-6. Each platform has four load cells, one mounted at each corner. The outputs from the individual load cells must be added to obtain a signal that represents the total reaction supported by the respective platform. This summing is achieved by exciting the load cell bridges, in parallel, from a single excitation winding of the platform excitation transformer. The output terminals from the bridges are connected in parallel to the input of the Channel Amplifier through isolating resistors. The signal resulting from four parallel bridges of equivalent resistance is expressed as:

$$E_o = \frac{E1 + E2 + E3 + E4}{4} = K\left[E_1 + E_2 + E_3 + E_4\right]$$

where; E_o = Net Output from four parallel load cell bridges.

E_1 - E_4 = Output voltage from individual load cell bridges.

K = Proportionality constant

The isolation resistors establish equivalent bridge resistance for parallel addition

4-7. Since the ratio approach is insensitive to line voltage changes the load cells are excited directly from the 400 Hz supply. The amplifier circuit includes a zero adjust potentiometer which adds an appropriate voltage for that channel as well as a capacitive balance potentiometer to remove quadrature unbalance. Refer to Figure 4-3 for a simplified schematic of the System.

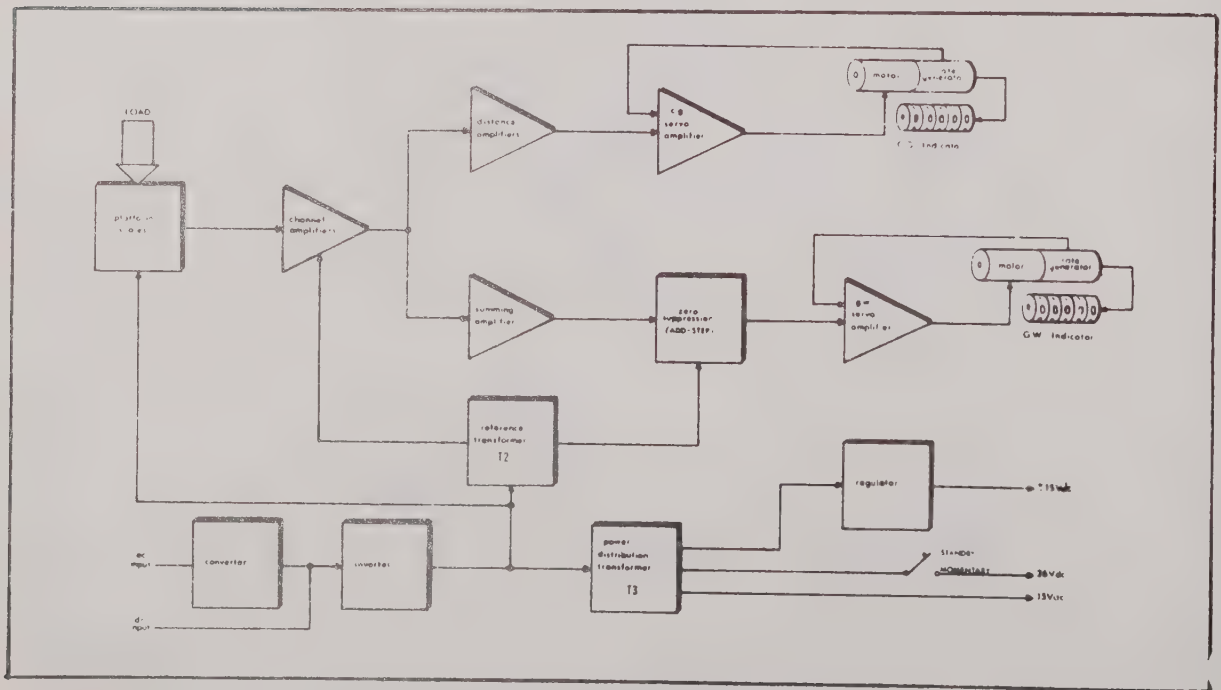


Figure 4-4. Mobile Electronics Weighing System Block Diagram

4-8. Channel Amplifiers.

4-9. AC Operational Amplifiers are used to raise the signal level from the platforms to the voltage required by the gross weight and CG computation circuitry. The gain of the Amplifier is set through the adjustment of the SPAN potentiometer which controls the feedback and consequently the overall gain of the channel. An integrated circuit contains all of the active and most of the passive circuitry in the Channel Amplifier module. The output of the Amplifier is connected into the System when required through a SPDT toggle switch.

4-10. Gross Weight Indication.

4-11. The outputs of the operational Amplifiers (A1-A12) are scaled by resistors (r1 - r12) and added at the junction marked (x) in Figure 4-3. This total signal, representing gross weight, is fed to the input of summing Amplifier A13. The amplified signal at the output of A13 is connected in phase opposition to the voltage across the gross weight rebalancing potentiometer P3. The Servo Amplifier senses the difference between the voltage across the potentiometer P3 and the summing Amplifier Output. A14 output drives a servo motor and the rebalancing potentiometer P3 until the voltage at the input of A14 is reduced to zero. An odometer type indicator is geared to the servo motor to provide a digital gross weight reading.

4-12. Zero Suppression is actuated by switch S15 (ADD STEP) which inserts discrete zero suppression voltages in series with the output of Summing Amplifier A13 and rebalance potentiometer P3. The Zero Suppression switch S15 is coupled through a gear train to the most significant digit on the odometer readout. Then, as Zero Suppression is changed, the weight indication is changed accordingly in the most significant digit.

4-13. Center of Gravity Indication.

4-14. The outputs of the Operational Amplifiers A3 to A12 are scaled by resistors r13 to r22. The scaled outputs are added in pairs at points Y1 to Y5 with the resulting voltages applied to the distance potentiometers P4 and P8. These potentiometers are set to represent the distance of each reaction from the reference point. The outputs of the distance amplifiers D1 through D5 represent the sum of the two reactions at each location in the platform configuration times the distance of the platform pair from the reference, in this case r, r'.

4-15. The output signals from Distance Amplifiers D1 through D5 are added at point (z). The voltage at this point represent the total reaction moment about the reference r, r'. As previously described (para. 4-10.), the sum of all Operational Amplifier outputs is applied through scaling resistors to the input of Summing Amplifier A13 which in turn produces a signal at point (u) that is directly proportional to gross weight. The primary function of A13 is to present a low source impedance and high power capability to potentiometer P10. The voltage (c) picked off potentiometer P10 is now equal to the sum of the voltages from Distance Amplifiers D1 through D5.

4-16. The voltage applied to P10 is proportioned to the gross weight W, and the voltage picked off the potentiometer is proportional to C x W. The voltage from the Distance Amplifiers D1 through D5 is proportional to the total reaction moment. These voltages are expressed as follows:

$$CW = (r + r1')d1 + (r2 + r2')d2 + (r3 + r3')d3 + (r4 + r4')d4 + (r5 + r5')d5$$

$$C = \frac{(r1 + r1')d1 + (r2 + r2')d2 + (r3 + r3')d3 + (r4 + r4')d4 + (r5 + r5')d5}{W} = CGL$$

In this equation, C represents the proportion of the voltage picked off P10 at balance. Therefore, the position of potentiometer P10 at balance represents the CGL location. The digital odometer coupled to the servo motor and P10 provides the CG indication in inches from the reference point.

4-17. Aircraft CG.

4-18. The CG location for aircraft is determined in the same way as described in Para. 4-13 by taking moments about the rear main gear. However, for aircraft the CG location is required with respect to the aircraft reference datum. The actual computation is based upon the CG location with respect to the rear main gear and is corrected by dialing in the distance of the rear main gear from the reference datum of the aircraft, through the differential mechanism coupled to the Aircraft CG odometer.

4-19. CIRCUIT DESCRIPTION.

4-20. General.

4-21. The circuit description in the following paragraphs is based upon one channel operation and is the same for all channels. Refer to the block diagram in Figure 4-4 and to the simplified schematic in Figure 4-3. Detailed schematics are located at the back of this manual.

4-22. Input Circuit.

4-23. Each platform scale consists of four 350-ohm load cell bridges excited by a common transformer. The transformer primary is supplied by the 115 V, 400 Hz, output from the Inverter. The secondary supplies approximately 10 volts to each bridge. The 200-ohm potentiometer is factory set when the platform was calibrated so that the platform output is 0. 13000 mV/V input (115 V) with a 50 000 lb load on the platform. The calibration accuracy is ± 0.05%. The outputs of the four load cells are paralleled and fed through interconnecting cables to the input circuit of the weighing amplifiers (one per platform scale). With power applied, any pressure on the load cells (load on the platform) changes the resistance, and generates a signal proportional to the weight on the platform.

4-24. Weighing Amplifier.

4-25. Input signals from the platforms are coupled to the operational amplifiers (A1 to A12) through the OPR position of the CAL-ZERO-OPR switch (S2) in each amplifier. Calibration and balance voltages are also applied to the input circuit. The voltage for calibration is supplied by the 10 Vac winding of transformer T2. The ZERO and CAP BAL potentiometers R16 and R15 are connected across this winding. Rotation of these controls from one end to the other provides a voltage from maximum positive through zero to maximum negative. This voltage is effectively in series with the signal from the transducer, so that a resistive or reactive unbalance in the transducers or cables is compensated for. The calibration voltage is taken from one side of the same 10 V winding and applied to one side of the differential input to the amplifier. An internal SPAN control (R11) sets the gain of the amplifier so that the output precisely represents the calibration signal. The output of each operational amplifier is connected to a single-pole, double-throw, switch (S1) which is set to ON to insert the channel amplifier into the System as required for a particular weighing operation.

4-26. Summing Amplifier.

4-27. Output signals from the operational amplifiers are applied to the resistor network R1 through R12 which combines and sums the weight signals at the junction of the twelve resistors and capacitor C1 (Point X in Figure 4-3). The total signal representing gross weight is coupled into the summing amplifier (A13) through C1. The output is connected in phase opposition to the voltage across the gross weight rebalancing potentiometer P3. The ADD-STEP resistor network is also connected across P3 to effectively increase the resistance of P3 as required for the total weight anticipated.

4-28. Gross Weight Servo Circuit.

4-29. The Gross Weight Servo Amplifier (A14) provides a linear transfer of the input signal to the output driving the servo motor. The input operation amplifier is an integrated circuit module with the output applied to the coupling transformer to drive the output stage which controls the voltage at the servo motor windings. The input signal from the arm of the balancing potentiometer P3 is coupled to the operational amplifier through capacitor C8. Diodes CR1 and CR2 clamp the input signal to approximately ±. 5 volt. Signals of opposing phase are applied to the amplifier from the reference circuit and from the rate generator. When the circuit is unbalanced (input signal applied by loading the platform) an error signal, which is the difference between the input voltage and the feed-back voltage, appears at the input of the operational amplifier. This error signal is amplified to sufficient strength to drive the servo motor. Since the rate generator and potentiometer P3 are both driven, the servomotor will continue to drive until the feed-back voltage equals the input voltage. When the error signal reaches zero (null) the servo motor stops and the system will remain at balance until there is a further change in the input voltage. The Null Meter is in the current path to the output stages of the amplifier and reads above zero as long as an output signal exists. When the instrument is at balance, no current is drawn by the amplifier and the meter dips to the null point. The digital readout is mechanically coupled to the servo motor/rate generator combination and at balance the reading represents the weight of the load applied to the platforms.

4-30. The balancing motor (servo) is a two-phase induction motor which operates when a control signal is generated by the amplifier. The control signal is in-phase or 180° out-of-phase with the line winding voltage.

The reference winding on the motor is shifted 90° by a capacitor in series with the winding. The amplitude and phase of the control signal determines the direction and speed of the servo motor rotation. The polarity of the amplifier input signal determines the relationship of the phase of the control signal, with respect to the phase of the line voltage, and thus determines the direction of motor rotation. The magnitude of the error signal determines the amplitude of the control signal which in turn determines the speed of motor rotation.

4-31. Rotation of the rate generator by the servo motor produces a feedback signal which has an amplitude component that is a function of speed and polarity that is determined by direction of rotation. The absolute values are controlled by the servo motor speed and direction.

4-32. Distance Amplifier.

4-33. Each Distance Amplifier (D1 through D4) operates with a pair of weight amplifiers. The output signals from the weight amplifiers are dropped across 10K resistors, summed, and fed to the INCHES potentiometer R1. The INCHES potentiometer is adjusted to indicate the distance between the particular pair of platforms/weight amplifiers and the reference pair. The signal is then picked off at the arm of the potentiometer and coupled through capacitor C1 to the input of the operational amplifier module. Potentiometer R17 is in the feedback loop and is set with the INCHES potentiometer at the high end to establish the overall gain of the amplifier. Potentiometer R16 is set with the INCHES potentiometer at the low end of the control. The amplifier output is fed to the servo amplifier in the INDICATED position of the ZERO INDICATED switch S1. The ZERO position of S1 shorts the output to ground disconnecting that amplifier from the System.

4-34. CG Servo Amplifier.

4-35. The CG Servo circuitry is the same as the Gross Weight servo circuit. Servo Amplifier A15 compares the sum of the signals from the Distance Amplifiers at the junction of R13-R18 and the signal from the rebalancing potentiometer P10 with the feedback voltage from the rate generator. The difference that exists when an input signal is generated by the Weight Amplifiers becomes the error signal, which is amplified to drive the servo motor, rate generator, and digital readout.

4-36. SPAN controls are inserted in series with the signal from the rebalancing potentiometer P10 for adjusting the amplitude of the signal in aircraft longitudinal mode. The ZERO adjust potentiometer is used to set the low end of the range of potentiometer P10.

4-37. Primary Power Supply.

4-38. Primary power is supplied to the System through cables and rear panel connectors and the front panel selector switch. Internal 24 V or external 24 V is fed directly to the Inverter while the 220 Vac power is fed to a rectifier circuit. This rectifier circuit is a transformer fed full-wave rectifier with an LC filter providing 24 Vdc, ± 1 V, to the Inverter input. The dc to ac Inverter is a solid-state module operating with 19 to 30 volts dc input to provide a closely regulated sinusoidal output of 115 volts at 400 Hz. Frequency is regulated to ±1%. The output of the Inverter is used to drive power transformer T3, reference transformer T2, and excitation transformer T1 (one in each platform).

4-39. The reference transformer T2 provides 15V, 1.5V and 10V for the ac signal circuits in the System. The 10V source is fed to the input circuits of the weight amplifiers for balancing and calibration.

4-40. The Power Distribution Transformer T3 provides power for a full-wave bridge rectifier circuit which in turn supplies ±24 Vdc to the Regulated Dual power Supply. Another secondary winding supplies power for a full-wave rectifier circuit to supply +28V to the servo output amplifier circuits. The third secondary supplies 15 Vac for servo motor and rate generator excitation.

4-41. Regulated Dual Power Supply.

4-42. The Regulated Dual Power Supply consists of two common-emitter series regulators for controlling both the +15 V and -15 V sources. The first stage of the positive voltage regulator is the differential amplifier Q3 and Q4. The reference voltage to the base of Q3 is the breakdown voltage of CR1. The voltage to be compared is the voltage applied to the base of Q4 which is directly proportional to the +15 V output. Any difference between the reference and comparison voltages is an error signal which is fed to the error voltage amplifier Q2. Q2 is an emitter-follower which provides the current necessary to drive the base of the series regulator Q1. Capacitor C1 prevents feedback instability at high frequencies. R1 and CR2 operate as a filter to reduce the amount of ripple and unregulated voltage variations introduced into the regulating amplifier. CR2 also provides a stable voltage source for the collectors of Q3 and Q4 as well as the emitters of Q5 and Q6 in the -15 V regulator.

4-43. The -15 V regulator functions exactly as does the +15 V regulator except that the voltage to be compared is essentially zero and the error polarity will produce the correct control voltage to Q8.

NOTES

SECTION V
MAINTENANCE

5-1. INTRODUCTION.

5-2. This section furnishes information on procedures required or which may be required to keep the BLH Mobile Electronic Weighing System (MEWS) operating properly. Equipment required are listed in Table 5-1 with the performance characteristics desired.

5-3. Operating instructions for special equipment required for calibration of the instrument and platform scales are covered in the appendices at the back of this manual.

5-4. PREVENTIVE MAINTENANCE.

5-5. Cleaning.

5-6. All components of the System can be cleaned with soap and water. The instrument case cover should be latched to prevent water from getting into the instrument. Clean front panels of the instrument with a soft lint-free cloth dampened with cleaning solvent (Fed Spec P-S661 or equivalent). Blow out interior with dry, filtered air (1 Atm) and then carefully wipe clean with a dry lint-free soft cloth.

5-7. Use the following if parts are disassembled:

a. Clean all non-electrical parts in cleaning solvent Federal Specifications P-S661 or equivalent.

b. Clean each electrical part with a soft brush or lint-free cloth. Do not use rags as lint may become lodged on or in parts being cleaned. Use dry compressed air (1 Atm) for drying.

c. Corrosion on steel parts, if not excessive, may be removed by lightly polishing with crocus cloth. Wash thoroughly with the cleaning solvent to remove powdered particles.

5-8. Battery Installation and Service.

The aircraft type battery used with this System is shipped with partially charged dry plates. Do not remove vent plugs until ready to fill the battery with acid. Before use, fill each cell with pure, diluted sulphuric acid of a specific gravity of 1.285 at 26.7°C. The acid gravity may be prepared from stronger acid by mixing the stronger acid with distilled water in the proper proportions.

DANGER

In mixing electrolyte, always pour acid into water, never pour water into acid, since considerable heat is evolved and the mixture may explode. Use hard-rubber, lead or glass containers for mixing electrolyte.

5-9. Place battery in service as follows:

a. Remove vent plugs from the cells. Fill each cell with 1.285 specific gravity sulphuric acid of a temperature not exceeding 90° F. (32° C.) to a height of 1 cm above protector on top of the separators.

b. Check electrolytic level one hour after filling and, if necessary, add more electrolyte to restore to 1 cm level above protector. Replace vent plugs in cells, and wash off any spilled electrolyte, using a cloth moistened with a solution of sodium bicarbonate.

c. The battery may now be charged at the rate shown on the nameplate. Connect the positive terminal of the battery to the positive of the charging line, and the negative terminal of battery to the negative of the charging line. Charge for at least 16 hours at recommended rates and until 4 consecutive hourly readings show no rise in specific gravity and voltage for each cell. Keep cell temperatures below 47°C . by reducing charging rate, if necessary.

Table 5-1. Recommended Test Equipment

TYPE	CHARACTERISTICS	PURPOSE	RECOMMENDED
Platform Simulator Platform Calibrator		Performance check, troubleshooting, calibration	See appendix A & B
AC/DC VTVM	1 mV to 100 V, 10 megohm impedance.	Troubleshooting	HP 400D
Decade Resistor	Total resistance, 10,000 ohms, multiple of 1 ohm . 05% accuracy.	Troubleshooting	Gen'l Radio 1434 M
Multimeter	± 1% accuracy at full scale	Troubleshooting	HP 412A
Oscilloscope	200 kHz bandwidth	Troubleshooting	HP 140 A
Variable Power Transformer	0-230 Vac	Performance check	VARIAC Gen'l Radio

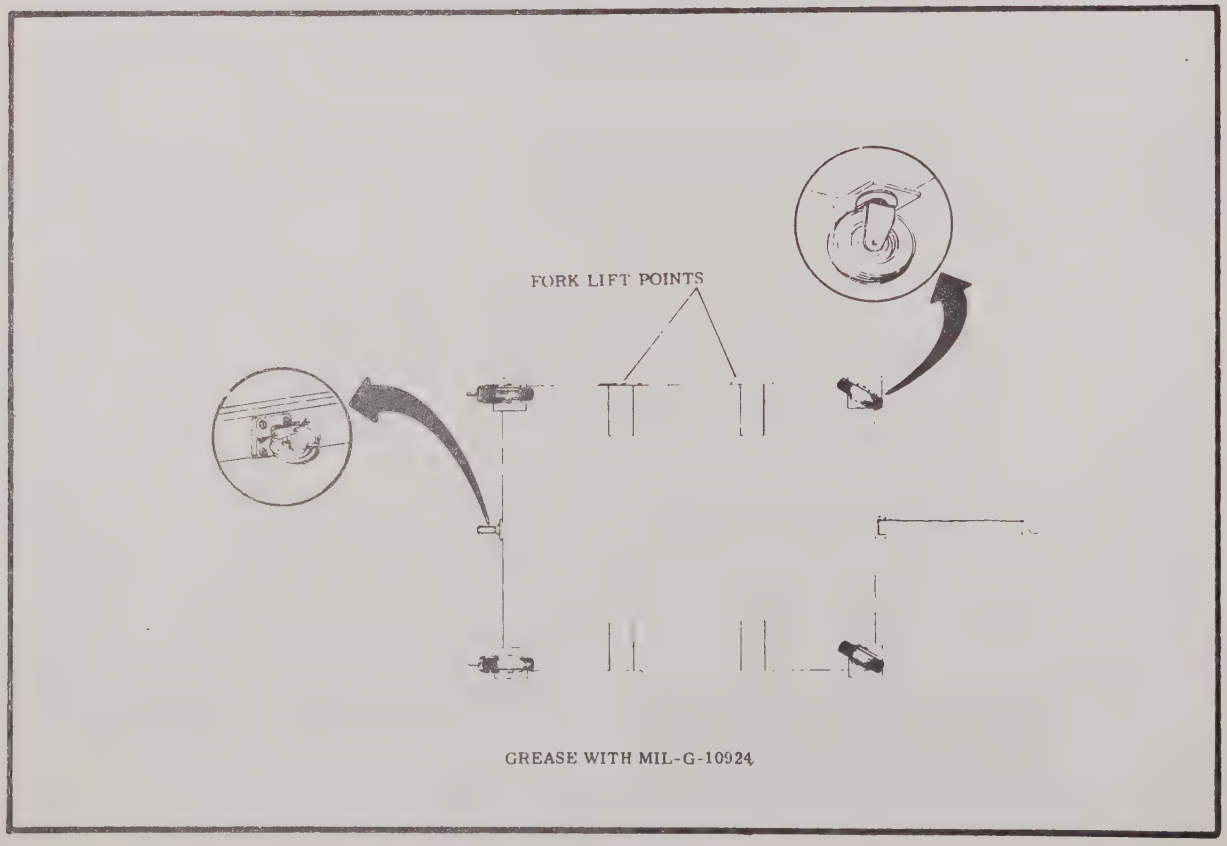


Figure 5-1. Trailer Lubrication.

d. The specific gravity of a completely charged battery should be between 1. 275 and 1. 295. Adjust specific gravity, if necessary, by removing electrolyte and adding suitable water, or stronger electrolyte. Charge for at least one hour before testing again whenever water or acid is added.

e. Mark battery cover with date battery is put into service with month and year preceded by letter S.

5-10. Prior to installing battery in the storage cabinet cut off the outer end of the drain tube liners and install the vent tubes. Place the battery in the storage cabinet, connect cables, and bolt down securely. Check that vent tubes protrude through the holes in the base of the cabinet.

5-11. Check electrolyte frequently. Add distilled or drinking water when required to maintain proper level. Battery should be charged monthly when not in service

5-12. Battery poles and connectors should be cleaned with a clean cloth or, where heavy corrosion occurs, with a stiff brush. Coat the battery poles and cable terminals with grease. Check that the battery is connected securely.

5-13. Tire Maintenance.

5-14. Typically the trailer tires are not subject to the normal hazards of rapid acceleration, violent braking and cornering, and the load to be carried will not exceed the design loading. Therefore, the tires need only to be protected from intense sunlight, fuel or oil. The tires should be checked occasionally for foreign objects (nails, glass, etc.) and for external damage.

5-15. Platforms, Ramps, Spacers.

5-16. Clean platforms, ramps and spacers with soap and water as necessary. Otherwise, sweep clean prior to use. Check that the pads on the platform are free to tilt in any direction. The threads on the load cell are permanently lubricated.

5-17. Lubrication.

5-18. The only System component requiring lubrication on a regular schedule is the trailer. Schedule depends upon location environment and frequency of use. Use the drawing in Figure 5-1 to locate the lubrication points. Grease as required with MIL-G-10924.

5-19. DISASSEMBLY.

5-20. Platform Scale.

5-21. The Platform Scale can be disassembled for replacing a load cell or electrical component. The common transformer and adjusting potentiometer are located on the connector side. Remove the cover plate on that side for access to these parts as well as wiring from the load cell transducers. Remove the cover plate on the opposite side for access to the wiring for the opposite load cells.

5-22. Remove any one of the load cells as follows using Figure 5-2 for reference.

NOTE: Reassembly requires the use of a special BLH tool NOT included in this MEWS package. The tool is listed in Table 6-1, page 6-14 and can be ordered direct from BLH.

a. Remove the cover plate on the side nearest the cell to be removed.

b. Disconnect the wires from the associated barrier strip.

c. Set the platform upside down to disassemble the pad and load cell.

d. Remove the three screws holding the center plate of the pad in place.

e. Remove the one bolt holding the stop key in place.

f. The pad can now be unscrewed past the stop on the load cell. The stop key will drop out on to oad cell. the boot ring.

g. Remove the sponge ring and the boot ring.

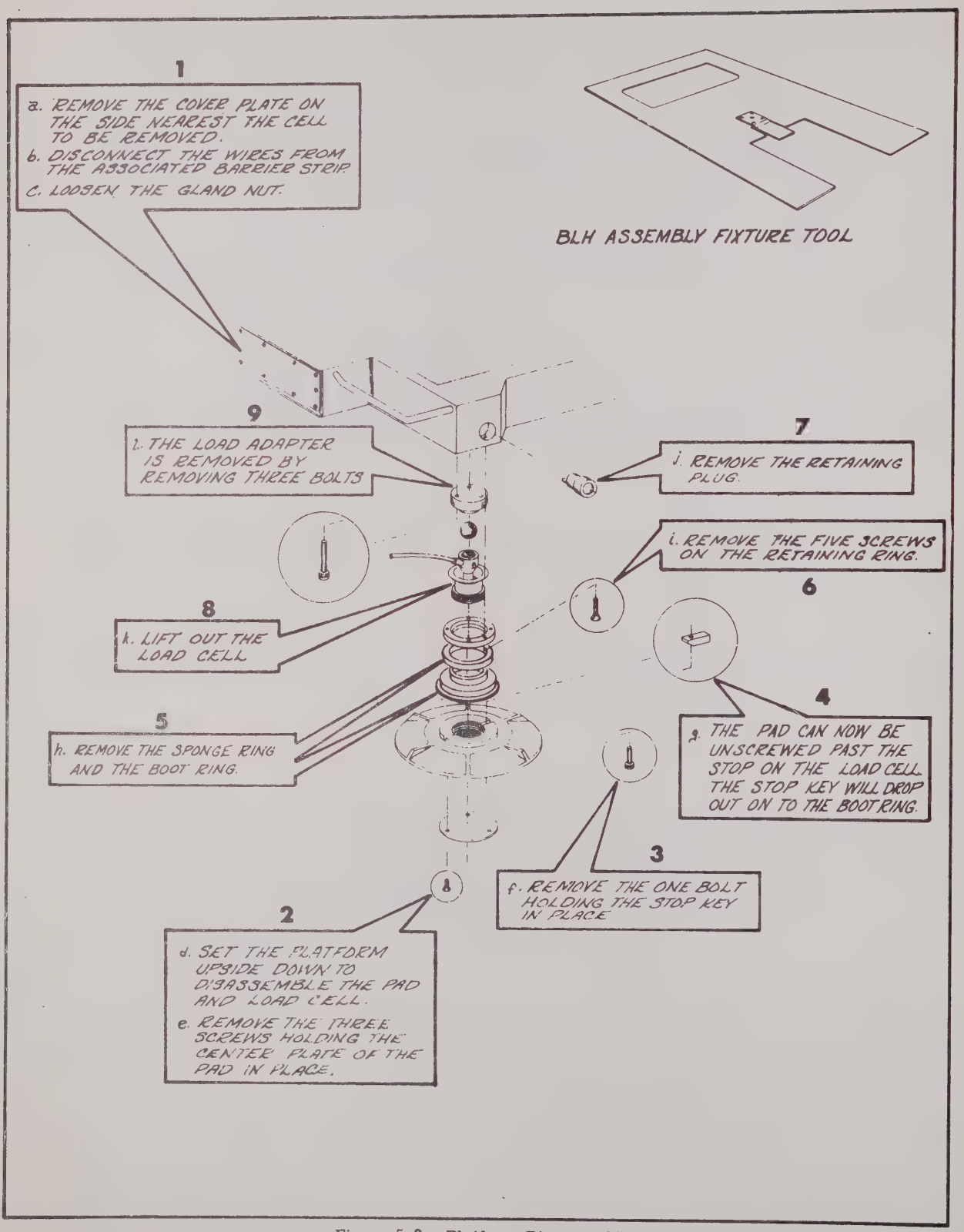

1
a. REMOVE THE COVER PLATE ON THE SIDE NEAREST THE CELL TO BE REMOVED.
b. DISCONNECT THE WIRES FROM THE ASSOCIATED BARRIER STRIP.
c. LOOSEN THE GLAND NUT.
BLH ASSEMBLY FIXTURE TOOL
9
l. THE LOAD ADAPTER IS REMOVED BY REMOVING THREE BOLTS
7
j. REMOVE THE RETAINING PLUG.
i. REMOVE THE FIVE SCREWS ON THE RETAINING RING.
6
8
k. LIFT OUT THE LOAD CELL
4
g. THE PAD CAN NOW BE UNSCREWED PAST THE STOP ON THE LOAD CELL. THE STOP KEY WILL DROP OUT ON TO THE BOOT RING.
5
h. REMOVE THE SPONGE RING AND THE BOOT RING.
3
f. REMOVE THE ONE BOLT HOLDING THE STOP KEY IN PLACE
2
d. SET THE PLATFORM UPSIDE DOWN TO DISASSEMBLE THE PAD AND LOAD CELL.
e. REMOVE THE THREE SCREWS HOLDING THE CENTER PLATE OF THE PAD IN PLACE.

Figure 5-2. Platform Disassembly.

h. Remove the five screws on the retaining ring.
i. Remove the retaining plug.
j. Lift out the load cell.
k. The Load Adapter is removed by removing three bolts.
l. Reassemble in the reverse order, feeding the cable through opening at the same time. Before assembling the retaining plug and retaining ring pull the wires taut. Feed the cable through the gland nut one wire at a time, then pull the cable through the gland nut.
Installation of the Stop Key requires a special BLH Assembly Fixture Tool. Use the following procedure after step 6 during reassembly.

a. Spray sponge side of boot ring with a flourocarbon dry lubricant.
b. Assemble sponge ring and boot ring in place over load cell.
c. Place BLH tool around load cell with the welded side (high end of spring tongue) towards the pad. Allow the spring tongue to touch the load cell on the platform side of the threads.
d. Screw the pad down 8 to 10 turns, the sponge will compress.
e. After the correct number of turns, stop with a key slot in the pad aligned over the spring of the tool.
f. Insert the Stop Key with the short bevel towards the pad.
g. Secure the Stop Key.
h. Remove the BLH tool, proceed with reassembly at step 2 page 5-4.

5-23. Instrument.

5-24. All components of the MEWS instrumentation module are removed from the front with the exception of the transformer assembly. The transformer assembly is accessible from the rear of the instrument module by removing the rear panels. Each front panel component is held in place by Phillips-Head screws, or simply plugged in. Use Figure 5-3 for reference.

5-25. Weight Amplifier. All weight amplifiers are identical and are held in position by screws at the top and bottom center of the front panel. Remove screws and pull forward to disconnect and remove. The printed circuit can be serviced without removal. The PC board is held in place by four screws and must be unsoldered from the wiring harness if it becomes necessary to replace the board. Front panel controls are easily removed with standard tools. Dummy weight amplifiers have no front panel controls and the PC board has only two resistors mounted on it.

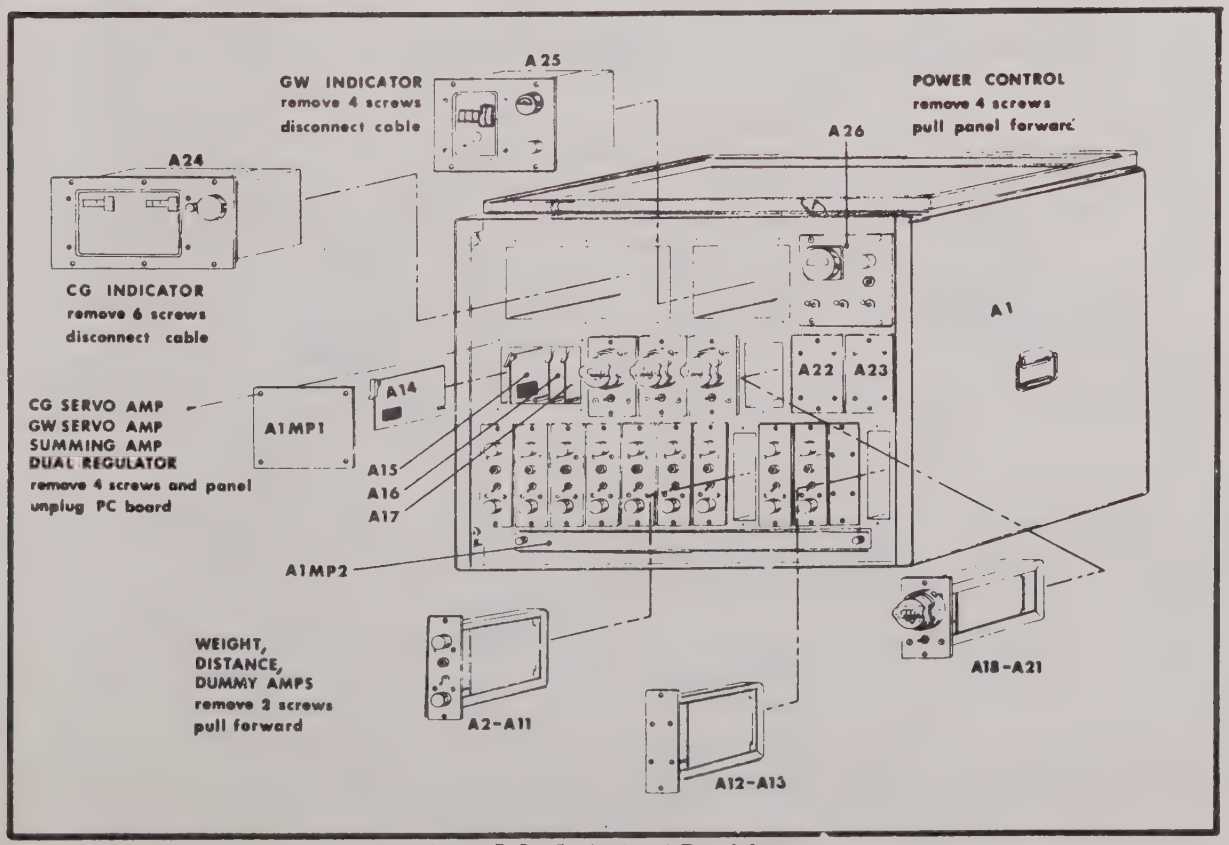


Figure 5-3. Instrument Breakdown

5-26. Distance Amplifiers. Distance Amplifiers D1 through D4 are identical. These units are also held in place by screws top and bottom. Remove screws and pull forward to remove. The printed circuit board is completely exposed and can be serviced without removing from the chassis. Front panel controls are also easily replaced. Dummy Distance Amplifiers have no front controls and the printed board has only a shorting loop on the foil. Refer to Figure 5-4 for instructions on removing the microdial on the distance control.

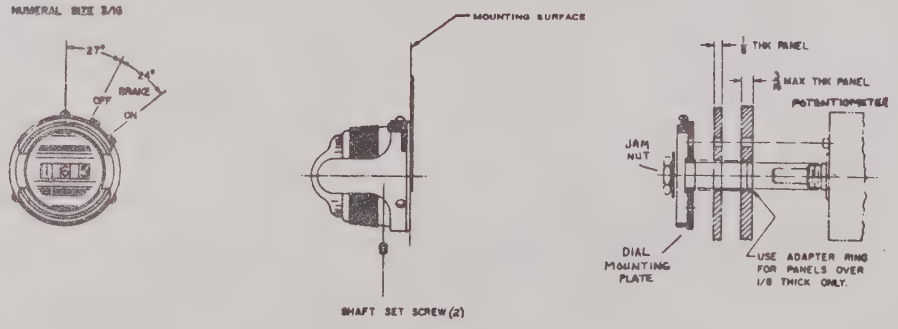
5-27. Gross Weight Module. The Gross Weight module consists of two integrated units; one with controls and printed circuit board and the other the hermetically sealed digital counter assembly. The GW unit is held in place with four screws (two at top, two at bottom). Remove the screws and lift forward to gain access to the rear connectors. Disconnect to remove the module from the System.

5-28. The two parts of the GW module are held together by the common front panel. Separate the control circuitry by removing the front panel knobs and hardware. The inner side of the control bracket will then be open for troubleshooting and repair.

5-29. Center of Gravity Module. The CG module consists of two integrated units. The hermetically sealed counter assembly and the control unit. The units are tied together by the common front panel. The module is held in the cabinet by three screws at the top and three screws at the bottom. Remove the screws to allow the module to be withdrawn from the cabinet far enough to disconnect two cables at the back of the module.

5-30. Separate the two units by removing the front panel control knobs and hardware and one Allen head screw just to the left of the function control. When the units are separated the inner part of the control section will be exposed for troubleshooting and repair. This section includes the Longitude-Lateral PC board.

5-32. Plug-In PC Boards. The printed circuit cards for the GW Amplifier, CG Amplifier, Summing Amplifier, and Dual Regulated Power Supply are mounted vertically behind the blank panel to the left of the Distance Amplifier Modules. Remove four screws at the corners of this panel for access to the plug-in units. Each card is then removed by pulling up on the lever handle to break the connection at the rear mating connector. Reinstall boards by pushing firmly against the outer edge.



1. Rotate dial to 002. Potentiometer is counterclockwise at this reading.
2. Remove two dust caps (set screws) to expose shaft set screws. #6 Allen wrench.
3. Loosen both shaft set screws with #6 Allen wrench.
4. Remove three screws to separate the dial from the dial mounting plate.
5. Remove jam nut and dial mounting plate. Potentiometer can then be removed from the rear of the panel.
6. Reassemble in reverse order. Make certain the potentiometer is at the counterclockwise stop and that the dial is at 002.

Figure 5-4. Micro-Dial Disassembly

5-33. Transformer Assembly. The Transformer Assembly which includes power supplies for the regulator card, servo output amplifiers, and servo motor/rate generator excitation, is accessible by removing the top panel at the rear of the instrument cabinet. This panel is held in place by sixteen screws. With this panel removed, the wiring side of the transformers, inverter, and the circuit board for the power supplies are open for troubleshooting. The power supply board is at the right side of the transformer chassis. The power supply board is mounted on stand-offs and the screws holding the board down must be removed to take the board out far enough for repair work. To replace a transformer (or the inverter) the lower panel with the connectors and fuses will have to be dropped open. Fourteen screws hold this panel in place. When replacing the rear panels, check that the rubber gaskets are in place. If loose, use cement to reseal.

5-34. ADJUSTMENTS.

5-35. General.

5-36. System controls consist of front panel operating controls and internal adjustments. The adjustments are controls that are used to bring the unit or system to peak operating efficiency and to keep it there. The operating controls are those used by the operator in the normal operation of the unit or system.

5-37. All internal adjustments are made and sealed at the factory.

5-38. TROUBLESHOOTING.

5-39. General.

5-40. The basic tools for troubleshooting the System are the schematics in Section VII, theory information in Section IV, and the performance checks and adjustments in this section. However, before attempting any repairs the technician should acquire all possible information regarding the complaint.

5-41. To locate trouble in the System start with a thorough visual inspection and then proceed with the electrical check as necessary. During the visual inspection look for loose components, loose or improper connections, blown fuses, abnormal indications on meter or digital readout. Check that switches and dials have been set to the proper position. Check for odors of burned insulation, charred resistors, over-heated transformers, etc. Repair any defect discovered during the visual inspection and check instrument performance before continuing troubleshooting.

5-42. The Troubleshooting Tree in Figure 5-5 is designed to aid in locating and correcting problems in the System. The Self-Check process operates to generate internal signals which are then tracked through the instrument. If problems exist the Self-Check separates the input devices from the instrument. If the Self-Check is successful any problems existing must occur before the input of the Weight Amplifier.

5-43. Self-Check.

5-44. When a malfunction is suspected, attempt the Self-Check process, page 3-3. If the instrument self-checks properly, check that all inputs are within System Specifications. Damaged connecting cables may be causing noise or intermittent connections. If malfunction still occurs (fails Self-Check), cause is internal to the instrument. Review the performance to help determine the source of trouble.

5-45. Substitution.

5-46. Troubleshooting is greatly simplified if checking is done by replacing assembly that is suspected of malfunction with spare assembly known to be operating correctly. This can be done effectively with the platform scales, cables, weight amplifiers, and distance amplifiers. If the power source is defective as indicated by the panel meter, select another source, if practicable. All voltage points are readily accessible for checking through the rear upper panel of the System. When the malfunctioning assembly is found, trouble can then be traced to individual components responsible for the malfunction, or replaced intact by a new assembly.

5-47. Platform Check.

5-48. If the instrument self-checks properly, then the connecting cables and platform should be checked for defects. Table 5-2 and Table 5-3 list the leakage resistances and ohmmic resistances between the live (not dummy) connector pins and between connector pins and the platform scale metal frame. Resistance values specified in the tables are for one platform only with no connection made to the dummy connector or to a second platform. The resistance values in the tables are approximations and are useful only as a troubleshooting aid in conjunction with the schematic on page 7-25.

5-49. Measurements can be made with megohm bridge, megohmmeter, insulation resistance test set, or other suitable test equipment. Voltage applied by the test equipment should not exceed 50Vdc for the leakage tests, and 10Vdc for resistance measurements.

CAUTION: Do not use greater than 10Vdc for resistance measuring because of the danger of damaging the platform transformer or load cell gages.

5-50. When checking leakage, make measurements first at the instrument end of the cable using Table 5-2. If the measurements indicate a defect, then disconnect the cable from the platform and then check the platform connector using Table 5-3. If the platform checks correctly, then the cable can be assumed to be faulty and should be checked.

5-51. Since leakage resistance measured will be a function of moisture, both in the air and around the connector pins, it is suggested that the connectors be carefully examined for condensation and for foreign matter between pins and shell and between pins before rejecting the platform or cable as defective.

Table 5-2. Platform /Cable Check List

Measure From	- To	Max. Volts	Approx. Resistance
Pin G	Platform Frame	Optional	0Ω
Pin D	Pin C	10Vdc	587. 5Ω
Pin F	Pin A	10Vdc	25 - 525*
Pin F	Pin G	50Vdc	100MΩ
Pin F	Pin D	50Vdc	100MΩ
Pin A	Pin G	50Vdc	100MΩ
Pin D	Pin G	50Vdc	100MΩ
Pin C	Pin G	50Vdc	100MΩ
Pin B	Pin G	Optional	0Ω

*Depending upon span setting

Table 5-3. Platform Check List

Measure From	- To	Max. Volts	Approx. Resistance
J1 Pin F	Platform Frame	50Vdc	100MΩ
J1 Pin A	Platform Frame	50Vdc	100MΩ
J1 Pin D	Platform Frame	50Vdc	100MΩ
J1 Pin C	Platform Frame	50Vdc	100MΩ
J1 Pin B	Platform Frame	50Vdc	100MΩ
J1 Pin G	Platform Frame	50Vdc	100MΩ
J1 Pin E	Platform Frame	50Vdc	100MΩ
J1 Pin D	J1 Pin C	10Vdc	587. 5Ω
J1 Pin F	J1 Pin A	10Vdc	25 - 525Ω*

*depending upon span setting

5-52. PRINTED CIRCUIT COMPONENT REPLACEMENT.

5-53. Transistor Replacement.

5-54. Transistors are inherently long-lived devices and should be replaced only when indicated as faulty.. Do not check soldered-in transistors by substitution as the transistor or circuit board may be damaged. Leakage current from the soldering iron or a momentary short can permanently damage a transistor.

5-55. Refer to paragraph 5-56 before attempting to replace a transistor, then use a hot 50 watt or smaller iron. Apply heat to the leads of part to be replaced, not to the printed circuit on the board. Clean holes before installing the new transistor. Use long-nose pliers as a heat sink betwen the iron and transistor. Allow the transistor to cool before applying power to the unit.

5-56. Servicing Etched Circuit Boards.

5-57. Excessive heat or pressure can lift the copper strip from the board. Avoid damage by using a low power soldering iron (50 watts maximum) and following these instructions. Copper that lifts off the board should be repaired by soldering a short length of tinned copper wire across the break. Use only high rosin core solder when repairing etched circuit boards. NEVER USE PASTE FLUX. After soldering, clean off any excess flux and coat the repaired area with a high quality electrical varnish or lacquer. When replacing components with multiple mounting pins such as transistors, electrolytic capacitors, and potentiometers, it will be necessary to lift each pin slightly, working around the component several times until it is free.

a. Apply heat sparingly to lead of component to be removed. If lead passes through an eyelet in the circuit board, apply heat on the component side. If lead does not pass through an eyelet, apply heat on the conductor side of the board.

b. Reheat solder in vacant eyelet and quickly insert a wood sliver or toothpick to clean inside of hole.

c. Bend clean tinned leads on new component and carefully insert through eyelets or holes on board.

d. Hold part against board (avoid overheating) and solder leads. Apply heat to component leads on correct side of board as explained in step 'a' above.

e. If the above steps are impractical or if the board has been damaged, clip the leads of the component to be removed close to the part itself leaving as long leads as possible still soldered to the board.

f. Straighten old leads and bend leads of new part around the protruding leads. Apply solder using a pair of long-nose pliers for a heat sink.

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION.

6-2. This section contains information for identifying and ordering replacement parts. Table 6-1 lists in alpha-numeric order by reference designator and provides the following information on each part:

a. BLH part number (where BLH is sole source).

b. Total quantity used in the instrument TQ column). Quantity listed where item first appears on list.

c. Recommended spares for year application in a remote location (or 2000 hours). RS column.

d. Typical manufacturer of the part (where applicable) in a five-digit code taken from the Federal Supply code for Manufacturers, Handbooks H4-1 (Name to Code) and H4-2 (Code to Name).

e. Manufacturer's part number.

6-3. ORDERING INFORMATION

6-4. To obtain replacement parts, address order or inquiry for parts to the nearest BLH Sales/Service Office or direct to BLH. Identify parts by BLH part numbers.

6-5. To order parts not listed in Table 6-1 provide the following:

a. Model number of instrument.

b. Serial number of the unit.

c. Description of the part including function and location.

6-6. To order a part from a manufacturer other than BLH, provide the component part description and the Manufacturer's code and part number from Table 6-1.

DESIGNATORS

A	- assembly	F	- fuse	P	plug	TC	thermo[illegible]
B	- motor	FL	filter	Q	transistor	V	vacuum tube, [illegible]
BT	- battery	HR	heater	QCR	- transistor-diode		bulb, photo[illegible] etc.
C	- capacitor	J	- jack	R	- resistor	W	cable
CR	- diode	K	- relay	RT	- thermistor	X	- socket
DL	- delay line	L	inductor	S	switch	XDS	lampholder
DS	- lamp	M	meter	T	transformer	XF	fuseholder
E	- misc electronic part	MP	mechanical part	TB	terminal board	Z	net[illegible]rk

ABBREVIATIONS

A	- ampere (s)	H	henry (hes)	nA	= nanoampere (s) = 10^{-9}	Se	= selenium
Ag	- silver	Hg	mercury	NC	= normally closed	sect	- section (s)
Al	- aluminum	Hz	cycles per second	Ne	- neon	Si	= silicon
Au	gold			NO	= normally open	si	= silde
		ID	- inside diameter	NPO	negative positive zero	SPDT	- single-pole double-throw
C	= capacitor	impg	impregnated		(zero temperature coefficient)	SPST	= single-pole single-throw
cer	= ceramic	incd	incandescent	ns	= nanosecond (s) = 10^{-9}		
coef	= coefficient	ins	- insulation (ed)			Ta	- tantalum
com	= common			Ω	= ohm (s)	tog	= toggle
comp	= composition	KΩ	- kilohm (s) 10^{+3}	OD	outside diameter	tol	= tolerance
conn	= connection	kg	- kilogram			trim	= trimmer
		KHz	= kilocycle (s) = 10^{+3}	ρ	- peak	TSTR	= transistor
dep	= deposited			pc	= printed circuit		
DPDT	- double-pole double-throw	I.	- indicator	pF	= picofarad (s) = 10^{-12}	V	= volt (s)
DPST	double-pole single-throw	lin	= linear taper	piv	= peak inverse voltage	vacw	= alternating current working volt (s)
		log	logarithmetic taper	p/o	part of	var	= variable
		m	- milli - 10^{-3}	pos	= position (s)	vdcw	= direct current working volt (s)
elect	= electrolytic	mA	= milliampere (s) = 10^{-3}	poly	= polystyrene		
encap	= encapsulated	mH	= millihenry (s) = 10^{-3}	pot	= potentiometer	W	= watt (s)
		MHz	= megacycle (s) = 10^{+6}	p-p	= peak-to-peak	w/	= with
F	= farad (s)	MΩ	= megohm (s) = 10^{+6}	prec	= precision (temperature	w/o	= without
FET	= field effect transistor	met film	= metal film		coefficient, long term	ww	= wirewound
fxd	= fixed	mfr	= manufacturer		stability, and/or tolerance.)		
		mtg	= mounting			*	= optimum value selected at factory, average value shown (part may be omitted)
GaAs	= gallium arsenide	μ	= micro = 10^{-6}	R	= resistor		
GHz	= gigacycle (s) = 10^{+9}	my	= Mylar®	rms	= root-mean-square		
gd	= guard			rot	= rotary		
Ge	= germanium						
grd	= ground (ed)						

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Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
End Item	416756-3			Weighing System, Electronic, Mobile	03089	
A1	417082-1		1	Instrument Assembly, Figure 7-1	03089	
A2 -A11	417354-3		10	Weight Amplifier, Figure 7-3	03089	
A12 -A13	405059-3		2	Dummy Weight Amplifier, Figure 7-4	03089	
A14	417347-3		1	CG Amplifier Assembly, Figure 7-5	03089	
A15	417346-3		1	GW Amplifier Assembly, Figure 7-6	03089	
A16	410111-3		1	Summing Amplifier Assembly, Figure 7-7	03089	
A17	404277-3		1	Power Supply Assembly, Figure 7-8	03089	
A18,A19, A20	410112-3		3	Distance Amplifier, D1, D2, D3, Figure 7-9	03089	
A21	410113-3		1	Distance Amplifier D4	03089	
A22,A23	405060-3		1	Dummy Distance Amplifier, Figure 7-10	03089	
A24	408983-4		1	CG Indicator Assembly, Figure 7-11	03089	
A25	408982-4		1	GW Indicator Assembly, Figure 7-12	03089	
A26	409845-2		1	Control Panel Assembly, Figure 7-13	03089	
A27	417364-1		1	Transformer Assembly, Figure 7-13	03089	
A28	416971-5		18	Platform Scale Assembly, Figure 7-14	03089	
	257936-4		8	Aircraft Spacer	00759	67P304
	257935-4		10	Aircraft Ramp, Aft	00759	
	257934-4		10	Aircraft Ramp, Forward	00759	67P305
	417150-1		1	Trailer with cabinet, Figure 7-15	03089	
	417151-1		1	Trailer	03089	

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
A1	417082-1		1	Instrument Assembly, reference Figure 7-1	03089	
A1MP1	405333-1		1	PC Board Cover	03089	
MP2	405275-3		1	Drawer, Instruction Cards	03089	
MP3	405378-4		1	Front Panel & Gaskets	03089	
MP4	405037-3		1	Rear Top Cover	03089	
MP5	405043-6		1	Cabinet (includes integral cover)	03089	
A1A1				Bottom Rear Panel Assembly		
	408990-4		1	Bottom Rear Panel	03089	
A1A1F1	137106-8		2	Fuse: cartridge, #3AG, 2Amp, 115V	81349	FO2A250V2A
F2	137105-8		7	Fuse: cartridge, #3AG, 10Amp, 24V	81349	FO2A32V10A
F3				Same as F2		
F4				Same as F1		
F5				Same as F2		
A1A1J1	137197-8		12	CONNECTOR: Signal Input	96906	MS3102R16S-1S
J2-J12				Same as J1		
J13	137193-8		1	CONNECTOR: Power (24V Internal)	96906	MS3102R18-5S
J14	137199-8		1	CONNECTOR: Power (24V External)	96906	MS3102R16-10S
J15	137198-8		1	CONNECTOR: Power (220Vac)	96906	MS3102R14S-7S
A1A2				Connector Plate Assembly		
	405039-4		1	Connector Plate	03089	
A1A2J101	137206-8		16	CONNECTOR: chassis	02660	225-21821-101
J102-J112				Same as J101		
J201-J204				Same as J101		
J205	137220-8		6	CONNECTOR: chassis	02660	225-21521-101
J206-J210				Same as J205		
A1A2P301	137207-8		2	CONNECTOR: plug	02660	48-06R14-15S
P302	137208-8		2	CONNECTOR: plug	02660	48-06R16-24S
P303				Same as P302		
P304				Same as P301		
P305			1	CONNECTOR: plug p/o Inverter	96906	MS3106R14S-5S
				MISCELLANEOUS		
	408827-3		8	Cable Assembly, dual terminals	03089	
	409717-3		2	Cable Assembly, single terminal	03089	
	257947-3		10	Cable Reel	03089	
	137200-8		8	CONNECTOR: cable	96906	MS3106E16S-1P
	137201-8		8	CONNECTOR: cable	96906	MS3106E16S-1S
	405481-3		2	Light Shroud	03089	
	137104-8		4	LAMP: miniature	71744	1252
	405482-1		4	Lamp Base	03089	
	137096-8		4	Lampholder (XDS3 - XDS6)	76568	6221
	136748-8		2	Pawl Fastener (drawer)	94222	27-10-301-20
	136790-8		8	PC Board Guide	19695	53-9016-1204
	137097-8		7	Fuse Holders	75915	FHN20G
	136845-8		13	Connector Dust Cover (1J1-1J12, 1J14)	96906	MS25043-16C
	137180-8		1	Connector Dust Cover (1J13)	96906	MS25043-18C
	137181-8		1	Connector Dust Cover (1J15)	96906	MS25043-14C
	410142-1		1	Instruction Cards, set	03089	

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
A2 (A3-A11)	417354-3		8	Weight Amplifier Assembly, Figure 7-3	03089	
A2A1	404724-2		1	Front Panel	03089	
A2A1MP1	404303-2		1	Chassis	03089	
MP2	406224-1		1	Knob, switch S2	03089	
MP3	124814-8		1	Knob, potentiometer R16	96906	MS91528-1N2B
MP4	203112-1		1	Shaft Lock, potentiometer R15	03089	
A2A1R15	137003-8		2	R: variable 10KΩ	80294	3500S2-103
R16			-	Same as R15		
	203456-1		1	Shaft Lock, R16		
A2A1S1	137001-8		1	Switch: toggle DPST	04009	TS3M
S2	137004-8		1	Switch: rotary, 3-pos, 4-pole	31356	V74031NSR05N30C3MGC
A2A2	404531-3		1	PC Board Assembly	03089	
	404530-3		1	PC Board	03089	
A2A2A1	402864-1		1	Amplifier Module	07263	UA709
A2A2C1				Not Used		
C2				Not Used		
C3	137063-8		1	C: 62pF	16299	CYFM10G620F
C4	137065-8		1	C: 10pF	16299	CYFM10G100C
C5				Not Used		
C6	137064-8		1	C: 220pF	16299	CYFM10G221F
C7	137072-8		2	C: mylar 0.01uF	95275	VK37VW103K
C8			-	Same as C7		
A2A2R1	137007-8		2	R: fxd film 1.704KΩ	81349	RB71AE17040D
R2			-	Same as R1		
R3	137013-8		4	R: fxd film 21.24KΩ	81349	RB71AE21240D
R4			-	Same as R3		
R5	137031-8		1	R: fxd comp 1.5KΩ	01121	CB1525
R6			-	Same as R3		
R7			-	Same as R3		
R8	137010-8		1	R: fxd comp 9.82KΩ	81349	RB71AE98200D
R9	137066-8		1	R: fxd film 1.5MΩ	81349	RN70D1504F
R10	137033-8		1	R: fxd comp 51Ω	01121	EB5105
R11	137046-8		1	R: variable 200Ω	80294	3290W1-201
R12	137008-8		1	R: fxd 120.326KΩ	19500	1350-120.326K
R13	137005-8		3	R: fxd 293.75Ω	19500	1350-193.75Ω
R14			-	Same as R13		
R15			-	Same as R13		
A12, A13	405059-3		1	Dummy Weight Amplifier Assembly, Figure 7-4	03089	
A12A1	405941-3		1	PC Board Assembly	03089	
	405940-3		1	PC Board		
A12A1R2	137018-8		1	R: fxd film 5KΩ	81349	RB71AE50000D
A12A1R1	137017-8		1	R: fxd 120.620KΩ	19500	1350-120.620K
A12MP1	405035-1		1	Front Panel	03089	
MP2	404303-2		1	Chassis	03089	

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
A14	417347-3		1	CG Amplifier Assembly, Figure 7-5	03089	
	404280-3		1	PC Board	03089	
A14A1	402864-1		1	Amplifier Module	07263	UA709
A14C1	137073-8		1	C: mica 220pF	95275	VK27BW22K
C2	137061-8		1	C: mica 5pF	16299	CYFM10G5R1C
C3	137076-8		1	C: mylar 39uF	05397	CSR13C396KL
C4	137078-8		1	C: mylar 2uF	00656	V146Z64
C5	137068-8		1	C: mylar 330uF	56289	CS13BB337K
C6	137077-8		1	C: mylar 1uF	00656	V164Z64
C7				Not Used		
C8	135300-8		2	C: mylar 0.1uF	15287	SCD30E104J
C9			-	Same as C8		
C10	137072-8		2	C: Mylar 0.01uF	95275	VK36CW103K
C11			-	Same as C10		
A14CR1	137051-8		4	Scon device: diode	12969	UTR22
CR2			-	Same as CR1		
CR3			-	Same as CR1		
CR4			-	Same as CR1		
A14Q1	135678-8		2	Transistor: NPN 2N3766	81350	2N3766
Q2			-	Same as Q1		
A14R1	137085-8		1	R: fxd 105Ω, 0.1%,1/8W	81349	RB71AE25000B
R2	137028-8		1	R: fxd 240K, 0.1%, 1/3W	19500	1250-240K
R3	137025-8		1	R: fxd 240K, 0.1%, 1/8W	81349	RB71AE24002B
R4				Not Used		
R5				Not Used		
R6				Not Used		
R7	137031-8		1	R: fxd comp 1.5K	01121	CB1525
R8	137355-8		1	R: fxd 175K, 0.1%, 1/8W	81349	RB71AE17502B
R9	127225-8		1	R: fxd comp 3.9K	81349	RC20GF392K
R10	132678-8		1	R: fxd ww 1Ω, 1/2W	75042	BW-1Ω-1/2W-5
R11				Not Used		
R12	137023-8		1	R: fxd 40K, 0.1%, 1/8W	81349	RB71AE40001B
R13	137016-8		6	R: fxd 100K, 0.05%, 1/8W	81349	RB71AE10002D
R14			-	Same as R13		
R15			-	Same as R13		
R16	137356-8		-	R: fxd 92.6K, 0.05%, 1/8W	19500	1350
R17			-	Same as R13		
R18			-	Same as R13		
R19	137029-8		1	R: fxd comp 220Ω	01121	CB2215
A14T1	137058-8		1	Transformer: coupling (audio)	80223	D1T230
				MISCELLANEOUS		
	137045-8		2	Heat Sink (Q1, Q2)	13103	6166B

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
A15	417346-3		1	GW Amplifier Assembly, Figure 7-6	03089	
	404280-3		1	PC Board		
A15A1	402864-1		1	Amplifier Module	07263	UA709
A15C1	137073-8		1	C: 220pF	95275	VK27BW22K
C2	137061-8		1	C: 5pF	16299	CYFM10G5R1C
C3	137076-8		1	C: 39uF	05397	CSR13C396KL
C4	137078-8		1	C: 2uF	00656	V146Z-8
C5	137068-8		1	C: 330uF	56289	CS13BB337K
C6	137077-8		1	C: mylar 1uF	00656	V146Z64
C7				Not Used		
C8	135300-8		2	C: mylar 0.1uF	15287	SCD30E104J
C9			-	Same as C8		
C10	137072-8		2	C: mylar 0.01uF	95275	VK36CW103K
C11			-	Same as C10		
A15CR1	137051-8		4	Scon device: diode	12969	UTR22
CR2			-	Same as CR1		
CR3			-	Same as CR1		
CR4			-	Same as CR1		
CR5	137110-8		2	Scon device: Diode Zener, 6.8V, 1W	81350	1N4736
CR6			-	Same as CR5		
A15Q1	135678-8		2	Transistor: NPN 2N3766	81350	2N3766
Q2			-	Same as Q1		
A15R1	137659-8		1	R: fxd 627Ω, 0.1%, 1/8W	81349	RB71AE10000B
R2	137028-8		1	R: fxd 240K, 0.1%, 1/3W	19500	1250-240K
R3	137025-8		1	R: fxd 240K, 0.1%, 1/8W	81349	RB71AE24002B
R4	137020-8		1	R: fxd 150Ω, 0.1%, 1/8W	81349	RB71AE150R0B
R5	129907-8		1	R: fxd 180K, 0.1%, 1/8W		
R6				Not Used		
R7	137031-8		1	R:fxd comp 1.5K	01121	CB1525
R8				Not used		
R9	127225-8		1	R: fxd comp 3.9K	81349	RC20GF392K
R10	132678-8		1	R: fxd ww 1Ω, 1/2W	75042	RW-1Ω-1/2W-5
R11				Not used		
R12	137023-8		1	R: fxd 40K, 0.1%, 1/8W	81349	RB71AE40001B
R13				Not used		
R14				Not Used		
R15				Not used		
R16				Not used		
R17				Not used		
R18				Not used		
R19	137029-8		1	R: fxd comp 220Ω	01121	CB2215
A15T1	137058-8		1	Transformer: coupling (audio)	80223	D1T230
				MISCELLANEOUS		
	137045-8		2	Heat Sink (Q1, Q2)	13103	6166B

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
A16	410111-3		1	Summing Amplifier Assembly, Figure 7-7	03089	
	404628-3		1	PC Board		
A16A1	402864-1		1	Amplifier Module	07263	UA709
A16C1	137067-8		1	C: 39uF	56289	CS13BC396K
C2	137062-8		1	C: 1500pF	16299	CYFM10G152F
C3	137063-8		1	C: 62pF	16299	CYFM10G620F
C4	137072-8		2	C: mylar 0.01uF	95275	VK36CW103K
C5			-	Same as C4		
A16J1	137050-8		1	Tip Jack: white	49956	TJ208W
J2	137049-8		1	Tip Jack: yellow	49956	TJ201Y
A16R1	137012-8		10	R: fxd 12K, 0.1%, 1/8W	81349	RB71AE12001B
R2			-	Same as R1		
R3			-	Same as R1		
R4			-	Same as R1		
R5			-	Same as R1		
R6			-	Same as R1		
R7			-	Same as R1		
R8			-	Same as R1		
R9	137402-8		2	R: fxd 22.2K, 0.05%, 1/8W	19500	1350
R10			-	Same as R9		
R11			-	Same as R1		
R12			-	Same as R1		
R13	137009-8		1	R: fxd 6K, 0.1%, 1/8W	81349	RB71AE60000B
R14	137036-8		1	R: fxd comp 1.5K	01121	EB1525
R15	137033-8		1	R: fxd comp 51	01121	EB5105

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
A17	404277-3		1	Power Supply Assembly, Figure 7-8	03089	
	404270-3		1	PC Board	03089	
A17C1	137075-8		2	C: mylar 0.1uF	24446	63F24AA104
C2			-	Same as C1		
C3	137074-8		2	C: elect 10uF, 50V	05397	CRS13G106KL
C4			-	Same as C3		
A17CR1	137052-8		1	Scon device: diode Zener	04713	1N937A
CR2	137053-8		2	Scon device: diode Zener	04713	1N753A
CR3			-	Same as CR2		
A17Q1	135678-8		1	Transistor: NPN power	04713	2N3766
Q2	137057-8		3	Transistor: NPN 2N910	07263	2N910
Q3			-	Same as Q2		
Q4			-	Same as Q2		
Q5	137056-8		3	Transistor: PNP 2N2907A	04713	2N2907A
Q6			-	Same as Q5		
Q7			-	Same as Q5		
Q8	137054-8		1	Transistor: PNP power	04713	2N3740
A17R1	137035-8		2	R: fxd comp 680Ω	01121	EB6815
R2	137037-8		2	R: fxd comp 68Ω	01121	GB6805
R3	137027-8		1	R: fxd 800Ω	19500	1250-800 ohms
R4	137043-8		4	R: fxd film 27K	81349	RN60D2742F
R5			-	Same as R4		
R6	137042-8		1	R: fxd film 22K	81349 03089 03089	RN60D2212F
R9	137038-8		1	R: fxd film 604Ω	81349	RN60D6040F
R10	137039-8		1	R: fxd film 909Ω	81349	RN60D9090F
R11	137030-8		1	R: fxd comp 750Ω	01121	CB7515
R12	137044-8		1	R: fxd film 39K	81349	RN60D3922F
R13	137040-8		2	R: fxd film 1.5K	81349	RN60D1501F
R14			-	Same as R2		
R15			-	Same as R1		
R16			-	Same as R4		
R17			-	Same as R4		
R18			-	Same as R13		
R19	137034-8		2	R: fxd comp 100Ω	01121	EB1015
R20			-	Same as R19		
R21	137041-8		2	R: fxd film 5.6K	81349	RN60D5602F
R22			-	Same as R21		
R23	137032-8		2	R: fxd comp 2.2K	01121	CB2225
R24			-	Same as R23		
				MISCELLANEOUS		
	137045-8		2	Heat Sink (Q1, Q8)	13103	6166B

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
A18,19,20	410112-3		3	Distance Amplifier Assy, D1, D2, D3	03089	
(A21)	(410113-3)		1	(Distance Amplifier Assy, D4) Figure 7-9	03089	
A18A1	410139-2		1	Front Panel Assembly, D1, D2, D3	03089	
	(410140-2)		1	(Front Panel Assembly, D4)	03089	
A18MP1	(410029-1)		1	Counting Dial, D1, D2, D3	03089	
	(410030-1)		1	(Counting Dial, D4)	03089	
MP2	404304-2		1	Chassis	03089	
R1	405823-1		1	R: Variable 10K	03089	
S1	137001-8		1	Switch: toggle	04009	TS3M
A18A2	404735-3		1	PC Board Assembly, D1, D2, D3	03089	
	(404735-3)		1	(PC Board Assembly, D4)	03089	
	404619-3		1	PC Board	03089	
A18A2A1	402864-1		1	Amplifier Module	07263	UA709
A18A2C1	137070-8		2	C: mylar 39uF	56289	150D396X9006B
C2			-	Same as C1		
C3	137060-8		1	C: 500pF	16299	CYFM15G511F
C4	137059-8		1	C: 20pF	16299	CYFM10G200G
C5	137072-8		2	C: mylar 0.01uF95275	95275	VK36CW103K
C6			-	Same as C5		
A18A2R2	129571-8		1	R: fxd comp 10K	81349	RC09GF103J
R3	137014-8		2	R: fxd film 40K	81349	RB71AE40001D
R4				Not USED		
R5			-	Same as R3		
R6				NOT USED		
R7	137006-8		1	R: fxd film 12.22K	81349	RB71AE12221D
R8	129551-8		1	R: fxd comp 1.5K	81349	RC09GF152J
R9	129822-8		1	R: fxd comp 51Ω	81349	RC20GF510J
R10	137011-8		2	R: fxd film 10K	81349	RB71AE10001D
R11			-	Same as R10		
R12				NOT USED		
R13				NOT USED		
R14				NOT USED		
R15				NOT USED		
R16	137046-8		1	R: fxd 200Ω	80294	3290W1-201
R17	137047-8		1	R: fxd 500Ω	80294	3290W1-501
A22,A23	405060-3		2	Dummy Distance Amplifier Assembly Figure 7-10	03089	
A22A1	405938-3		1	PC Board	03089	
A22MP1	405034-1		1	Front Panel	03089	
MP2	404304-2		1	Chassis		

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
A24	408983-4		1	CG Indicator Assembly Figure 7-11	03089	
A24A1	410051-3		1	Reference Datum Assembly	03089	
A24A1R4	129829-8		1	R: fxd comp 100Ω	81349	RC20GF101J
S1	137165-8		1	Switch: rotary	31306	V72035N-SR05N-30CM3MGC
S2	405000-1		1	Magnet Assembly	03089	
	405002-1		1	Mitergear Assembly, p/o A1S2	03089	
J302	137164-8		1	Connector	02660	48-00R16-24P
A24A1A1	410056-1		1	LONG/LAT Span Assembly	03089	
	410058-2		1	PC Board	03089	
A24A1A1R1	137167-8		1	R: variable 50K	80294	3070P1-503
R2				Not used		
R3	137169-8		1	R: variable 20Ω	80294	3070P1-200
				MISCELLANEOUS		
	410052-3		1	REFERENCE DATUM Bracket	03089	
	124858-8		1	REFERENCE DATUM Knob	96906	MS91528-3S2B
A24A2				Indicator Assembly, p/o A24	03089	

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
A25	408982-4		1	Gross Weight Indicator Assembly, Figure 7-12	03089	
A25A1	408984-3		1	ADD-STEP Assembly	03089	
A1J304	137142-8		1	CONNECTOR: receptacle	96906	MS24264R1415P
A1S1			-	Not used		
S2	405358-1		1	Switch: rotary (ADD-STEP)	03089	
	405000-1		1	Magnet Assembly, p/o S2	03089	
	405207-1		1	Mitergear Assembly, p/o S2	03089	
A25A1A1	419466-3		1	GW Servo Assembly	03089	
	410076-3		1	PC Board	03089	
A1A1C1			2	Select Value (0.002 μF)	03089	
C2			-	Same as C1		
A1A1R1	130380-8		1	R: fxd ww 800Ω	81349	RB71AE800R0B
R2	137150-8		10	R: fxd ww 206.4	81349	RB71AE206R4B
R3	137092-8		1	R: variable 500	80294	3070P1-501
R4	137148-8		1	R: fxd ww 200	03089	
R5			-	Same as R2		
R10						
R11			-	Same as R2		
R12			-	Same as R2		
R13			-	Same as R2		
R14	137147-8		1	R: variable 200	80294	3070P1-201
R15	137149-8		1	R: fxd ww 140	81349	RB71AE140R0B
R16	137153-8		1	R: fxd ww 4800	81349	RB71AE48000B
				MISCELLANEOUS		
	406224-1		1	Knob: control	03089	
	410091-3		1	Bracket: ADD-STEP	03089	
A25A1M1	407861-1		1	Null Meter 500-0-500		DeJur S100

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
A26	409845-2		1	Control Panel Assembly, Figure 7-13	03089	
A26DS1	137174-8		1	Indicator Light Assembly	96906	MS25256-8
	137175-8		1	Indicator Lamp	96906	MS25237-327
A26M1	405748-1		1	METER: Volt, dc	03089	
A26S1	137079-8		1	Switch: rotary, power	91812	91994-4-B3N
	406224-1		1	Knob: POWER control	03089	
A26S3	137353-8		1	Switch: toggle (STBY-READ)	96906	MS25308-222
A26S4	137354-8		1	Switch: toggle (ON-LIGHTS)	96906	MS35307-302
A26S2	137352-8		1	Switch: toggle (ON-POWER)	96906	MS35302-222

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
A27	417364-1		1	Transformer & Power Supply Assembly Figure 7-13	03089	
A27A1			1	Transformer Assembly	03089	
A27A1C1	137082-8		1	C: elect 2000uF, 50V	00656	HCB2000uF50
A27A1CR1	137081-8		2	Scon device: diode, power	04713	1N3880
CR2			-	Same as CR1		
A27A1L1	137215-8		1	Filter Coil	80223	H172
A27A1T1	416641-1		1	Transformer: power	03089	
T2	404262-1		1	Transformer: power	03089	
T3	404328-1		1	Transformer: power	03089	
A27A2	417365-3		1	PC Board Assembly	03089	
	406024-3		1	PC Board	03089	
A2 A2C1	137091-8		3	C: elect 22uF, 50V	56289	150D226X9050S2
C2			-	Same as C1		
C3	137089-8		2	C: elect 3uF, 100V	99515	M1-305E
C4	137090-8		2	C: elect 1uF, 100V	99515	M1-105E
C5			-	Same as C3		
C6			-	Same as C4		
C7			-	Same as C1		
C8			1	C: Select Value	03089	
C9			1	C: Select Value	03089	
A27A2CR1	137086-8		6	Scon device: diode 1N3611	04713	1N3611
CR2			-	Same as CR1		
CR3			-	Same as CR1		
CR4			-	Same as CR1		
CR5			-	Same as CR1		
CR6			-	Same as CR1		
A27A2R1	137093-8		2	R: fxd comp 7.5Ω	01121	GB7R55
R2			-	Same as R1		
R3	137094-8		2	R: fxd comp 2.2K	01121	GB2225
R4			-	Same as R3		
R5	137095-8		2	R: fxd comp 100Ω	01121	HB1015
R6			-	Same as R5		
R7			1	R: fxd comp .27Ω	01121	GB6805
R8	137092-8		1	R: variable 500Ω	80294	3070P1-501
R9	137195-8		1	R: fxd ww 100Ω, 0.1%, 1/8W	19500	1250-100-.125W
A27PS1	406844-1		1	Inverter Assembly (Figure 7-1)	03089	

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
A28-A35	416971-5		18	Platform Scale Figure 7-14	03089	
A28MP1	413798-2		4	Terminal Board Assembly	03089	
MP2			-	Same as MP1		
MP3			-	Same as MP1		
MP4			-	Same as MP1		
	136854-8		8	R: fxd 1K, p/o Terminal Board Assy	19500	1250-1K
MP5	404425-1		4	Gland Nut	03089	
MP6			-	Same as MP5		
MP7			-	Same as MP5		
MP8			-	Same as MP5		
	204484-1		4	Gland Washer	03089	
	204483-1		4	Seal	03089	
A28J1	409855-1		1	CONNECTOR: receptacle	96906	MS3102E16S-1P
	136845-8		1	Connector Cap & chain, p/o J1	96906	MS25043-16C
J2			1	Same as J1		
A28R9	136893-8		1	R: variable 500Ω	80294	3520S1-501
A28T1	404264-1		1	Transformer: power	03089	
A28A1			4	Load Cell/Pad assembly	03089	
A28A1MP1	405948-1		1	Plug	03089	
MP2	401206-2		1	Load Adapter	03089	
MP3	406707-1		1	Load Ball	03089	
MP4	418567-2		1	Load Cell	03089	
	419393-1		1	Boot Ring	03089	
	419394-1		1	sponge ring	03089	
	401213-1		1	Retaining Ring	03089	
MP6	401611-2		1	Pad Assy	03089	
MP7	416743-1		1	Stop Key	03089	
MP9	401214-1		1	Pad Bottom Cover	03089	
				MISCELLANEOUS		
	404427-2		1	Bubble Level	82084	2-10018
	404426-1		2	Cover Assembly, large	03089	
	404415-2		2	Cover Assembly, small	03089	
R10	129881-8		1	R: fxd 15K, 10%, 1/2W, p/o J2	81349	RC32GF-153K
R11			1	R: fxd 587.5, 0.05%, 1/2W, p/o J2	19500	1250
R1-R8	136854-8		8	R: fxd 1000, 0.05%, 1/2W, p/o A28MP1, A28MP2, A28MP3, A28MP4	19500	1250
OPTIONAL	F-404408-5-1			**Assembly Fixture Tool (Not included)**		

Table 6-1. Replaceable Parts

Ref Desig	BLH Part No.	RS	TQ	Description	Mfr	Mfr Part No.
End Item	417150-1		1	Trailer With Cabinet	03089	
	417151-1		1	Trailer, Empty	03089	
				Miscellaneous		
	417157-1		1	Cover, Cabinet Trailer, Fabric	03089	
	417156-1		1	Cover, Empty Trailer, Fabric	03089	

SECTION VII

DIAGRAMS

7-1. INTRODUCTION.

7-2. This section contains the schematics and illustrated parts locations for all the component units of the Mobile Electronic Weighing System.

7-3. The following is a list of drawings in order:

Figure 7-1. System Assembly Breakdown

Figure 7-2. Interconnection Diagram

Figure 7-3. Weight Amplifier Schematic and Parts Location

Figure 7-4. Dummy Weight Amplifier Schematic and Parts Location

Figure 7-5. CG Servo Amplifier Schematics and Parts Location

Figure 7-6. GW Servo Amplifier Schematics and Parts Location

Figure 7-7. Summing Amplifier Schematics and Parts Location

Figure 7-8. Dual Regulated Power Supply Schematic and Parts Location

Figure 7-9. Distance Amplifier Schematic and Parts Location

Figure 7-10. Dummy Distance Amplifer Schematic and Parts Location

Figure 7-11. Center of Gravity Indicator Schematic and Parts Location

Figure 7-12. Gross Weight Indicator Schematic and Parts Location

Figure 7-13. Control Panel, Transformer Chassis Schematic and Parts Location

Figure 7-14. Platform Scale Schematic and Parts Location

Figure 7-15. Trailer Parts Location

Schematic Diagram Notes

REFER TO (MIL-STD-15-1) FOR SCHEMATIC SYMBOLS NOT LISTED IN THIS TABLE

= ETCHED CIRCUIT BOARD

= FRONT PANEL MARKING

= REAR PANEL OR INTERNAL ADJUSTMENT MARKING

= FRONT PANEL CONTROL

= SCREWDRIVER ADJUSTMENT

CW = INDICATES MOVABLE CONTACT POSITION AT CLOCKWISE ROTATION LIMIT OF CONTROL SHAFT. (SHAFT VIEWED FROM KNOB OR SLOTTED END)

= PRIMARY SIGNAL PATH

= FEEDBACK PATH

= WAVEFORM TEST POINT (WITH NUMBER)

= COMMON POINT (WITH LETTER)

= AVALANCHE (ZENER) DIODE

= TUNNEL DIODE

= STEP RECOVERY DIODE

= SIGNAL GROUND

= CHASSIS

N.C. = NO CONNECTION P/O = PART OF

* = OPTIMUM VALUE SELECTED AT FACTORY, AVERAGE VALUE SHOWN, PART MAY HAVE BEEN OMITTED

UNLESS OTHERWISE INDICATED
CAPACITANCE IN PICOFARADS
INDUCTANCE IN MICROHENRIES
RESISTANCE IN OHMS

NUMBERS IN PARENTHESES INDICATE WIRE COLOR USING RESISTOR COLOR CODE
e.g. WHT-RED-GRN is (9-2-5)

0 - BLACK
1 - BROWN
2 - RED
3 - ORANGE
4 - YELLOW
5 - GREEN
6 - BLUE
7 - VIOLET
8 - GRAY
9 - WHITE

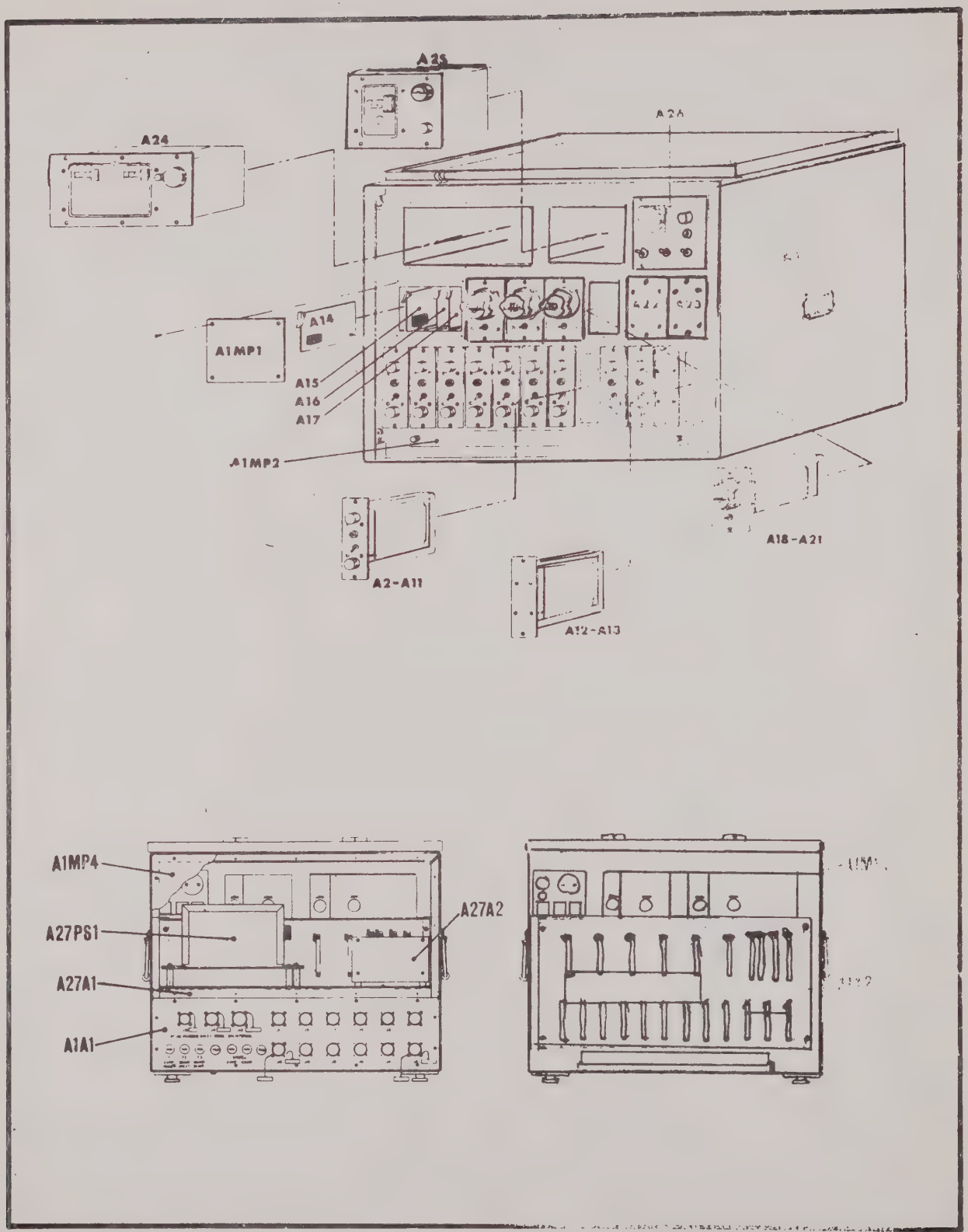


Figure 7-1. System Assembly Breakdown

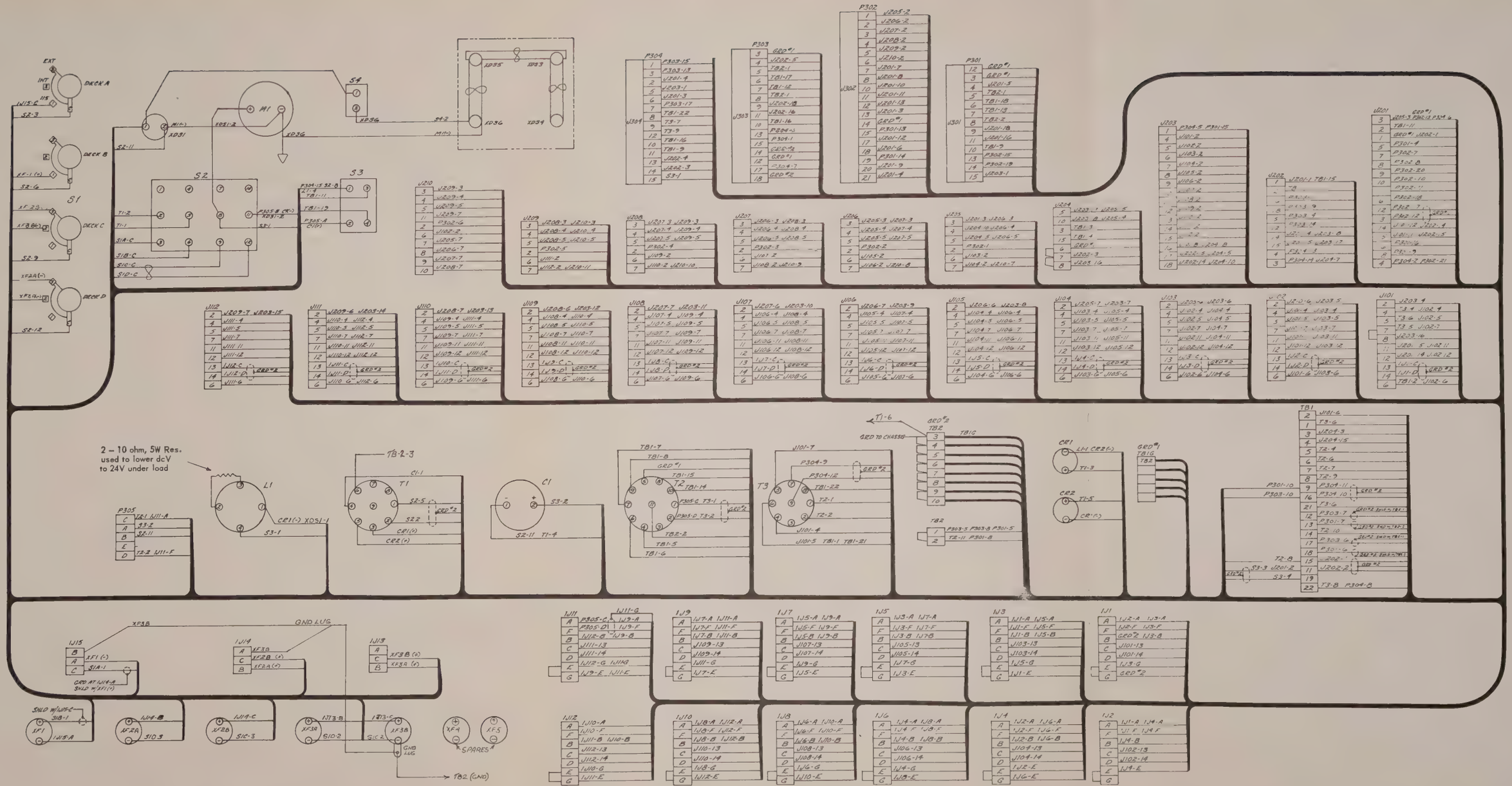


Figure 7-2. Interconnection Diagram

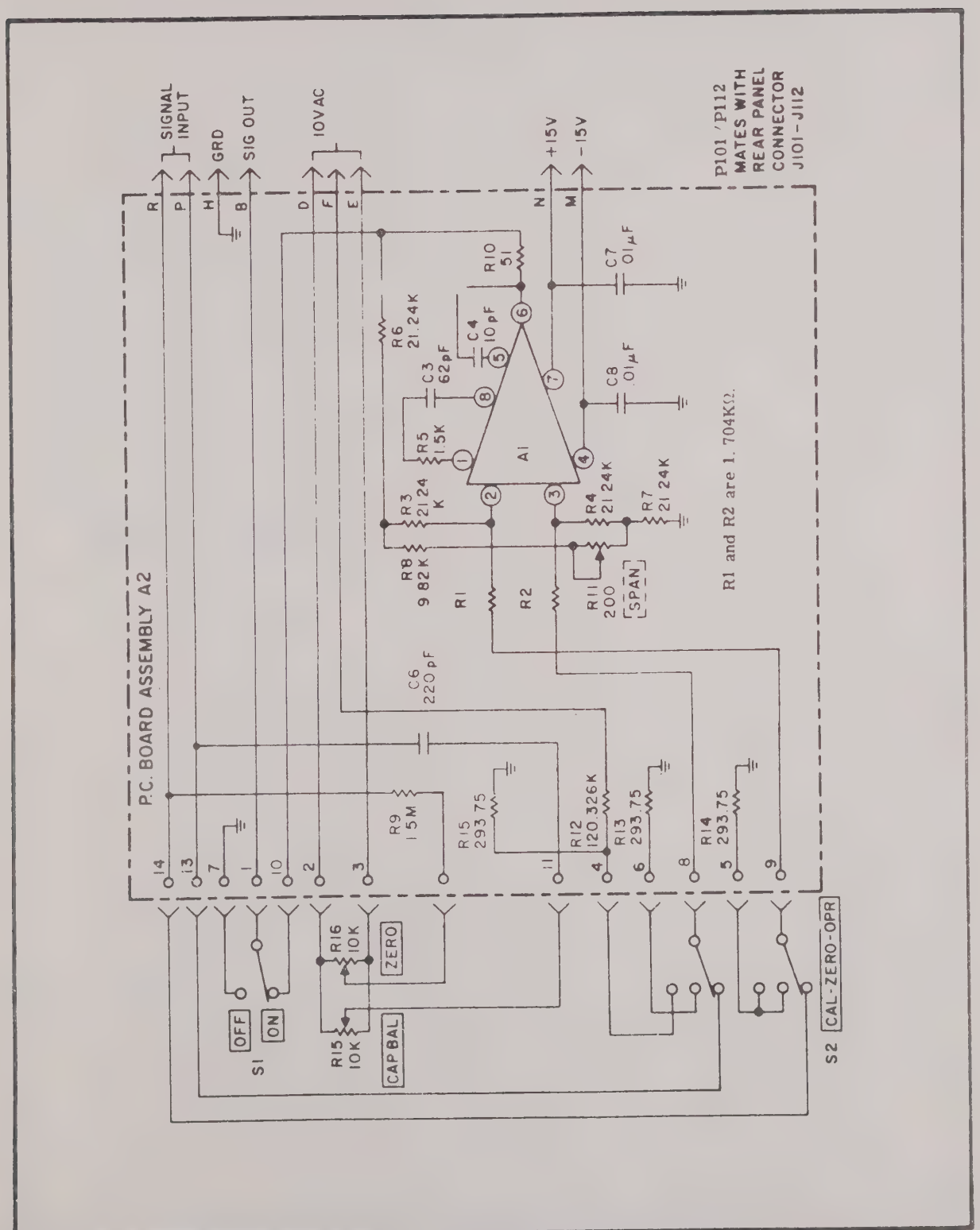
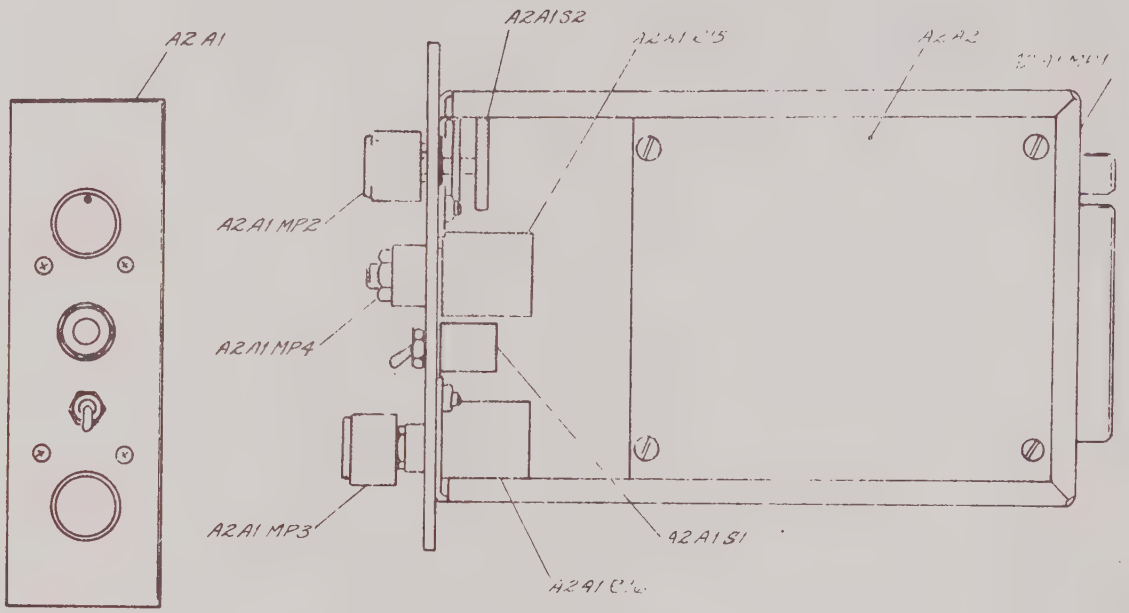


Figure 7-3. Weight Amplifier Schematic & Parts Location



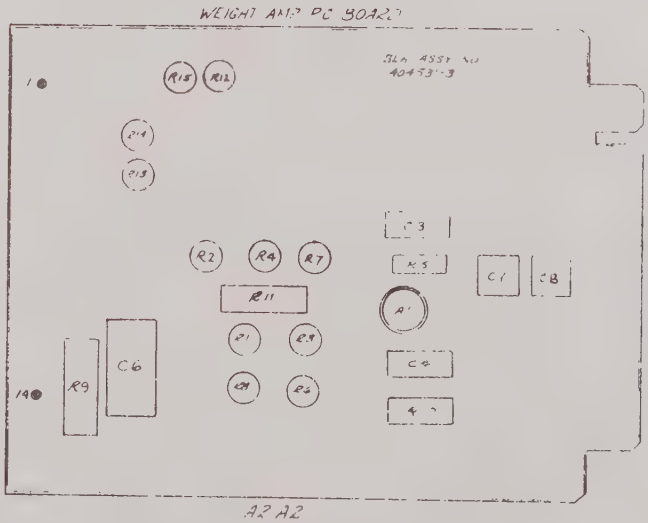


Figure 7-3. Weight Amplifier Schematic & Parts Location (Cont'd.)

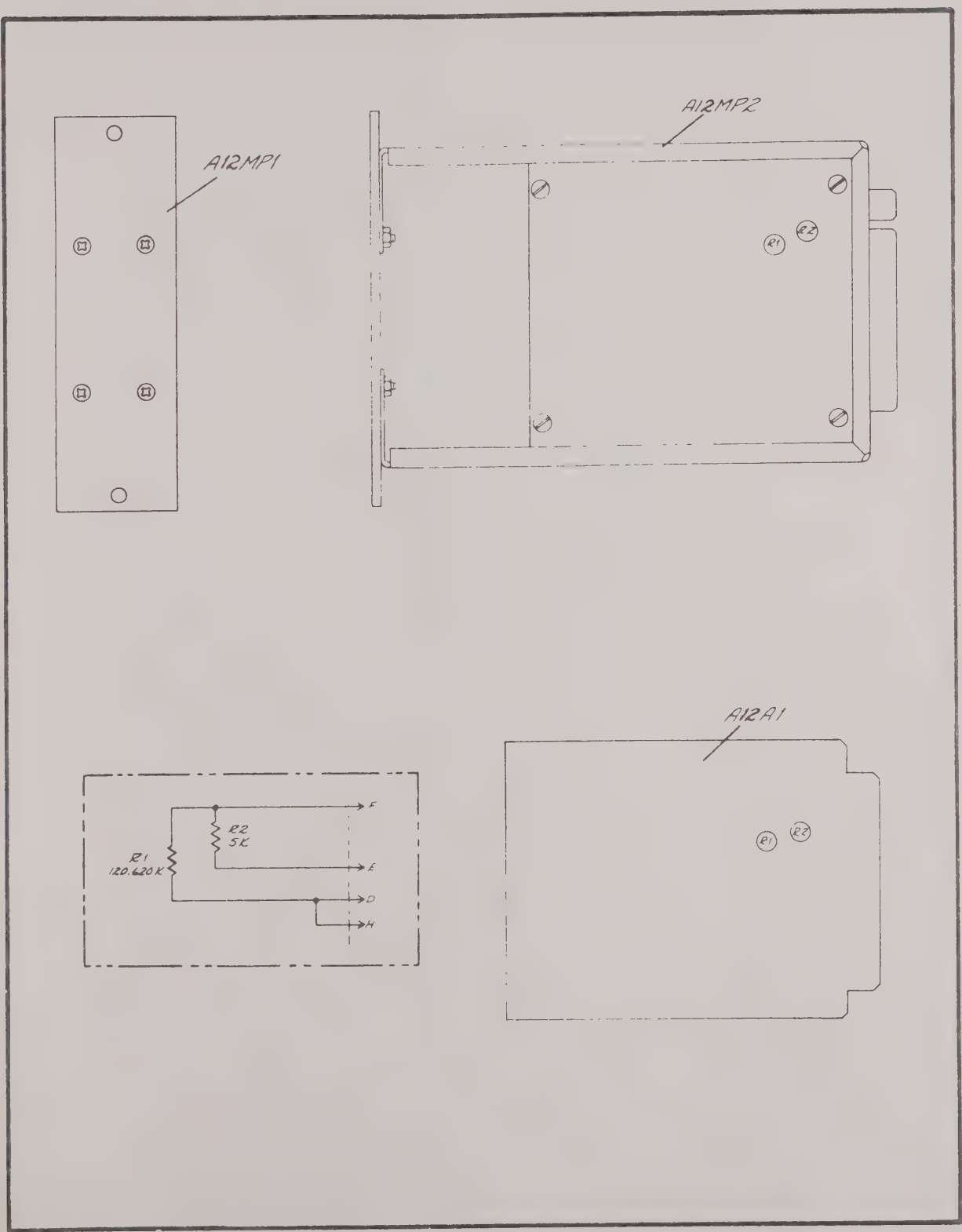


Figure 7-4. Dummy Weight Amplifier Schematic & Parts Location

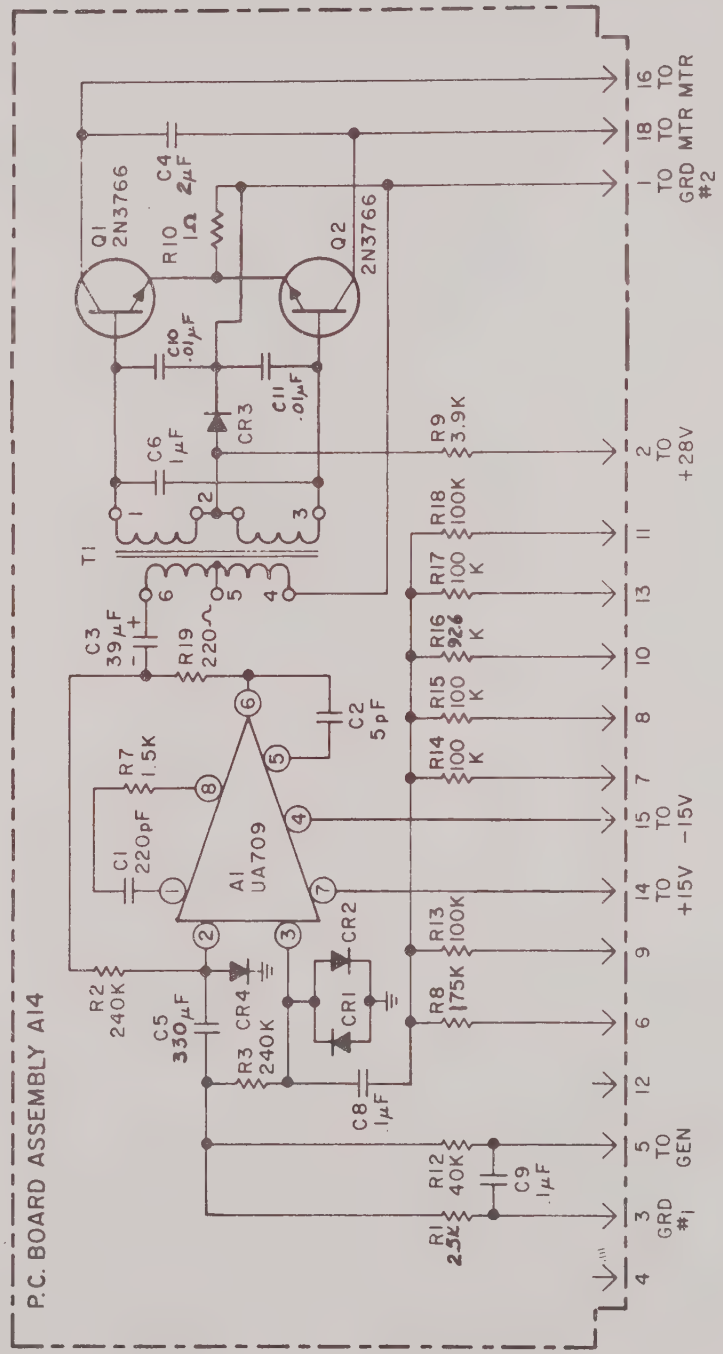


Figure 7-5. CG Servo Amplifier Schematic & Parts Location

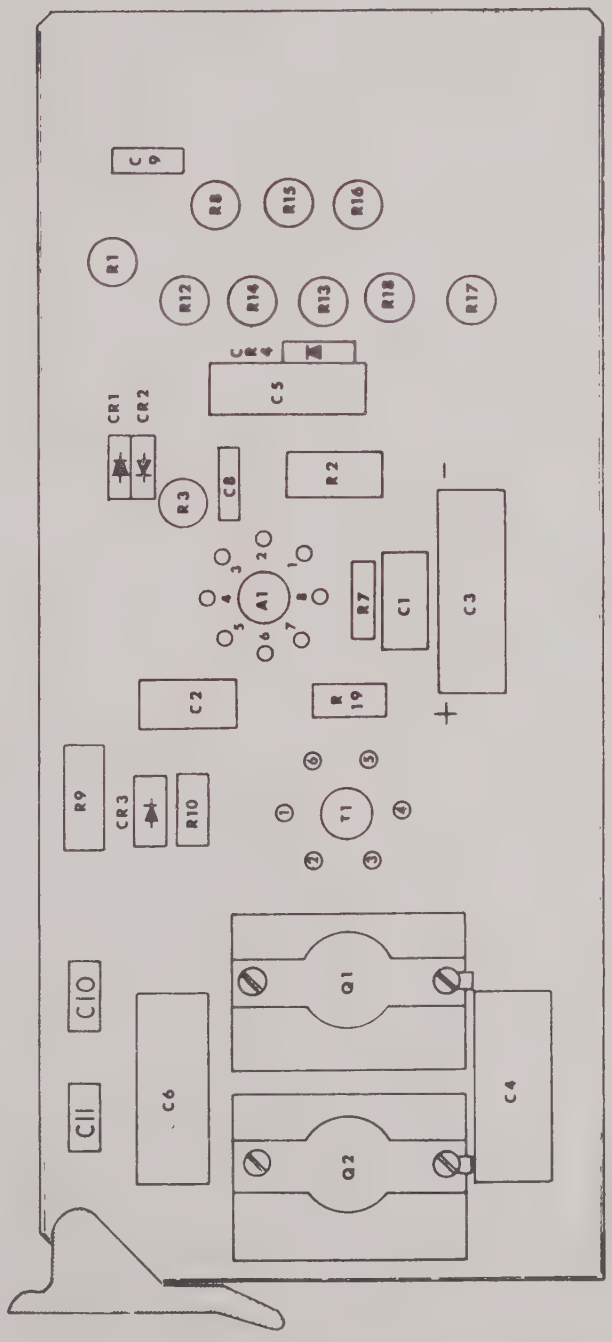


Figure 7-5. CG Servo Amplifier Schematic & Parts Location (Cont'd.)

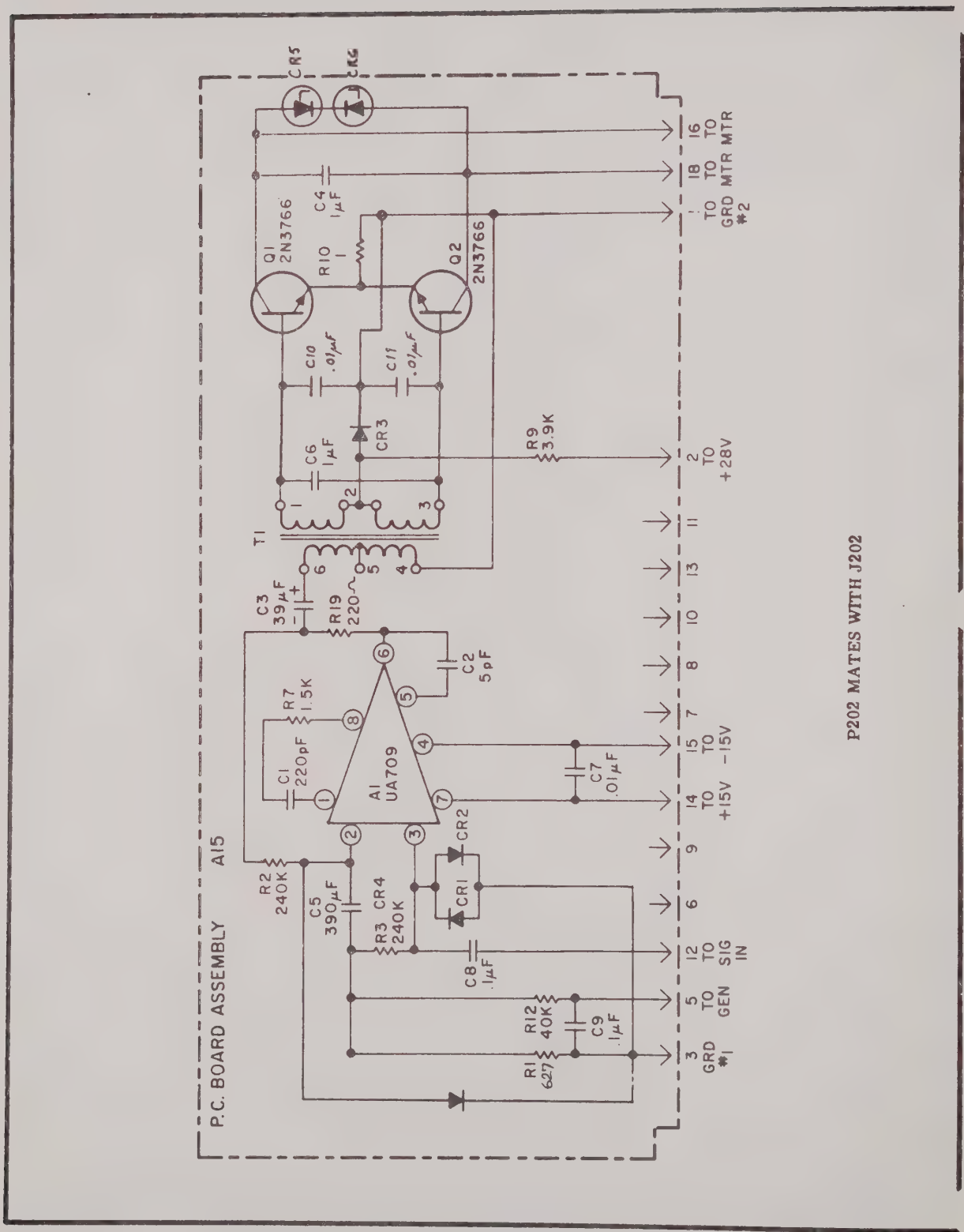


Figure 7-6. GW Servo Amplifier Schematic & Parts Location

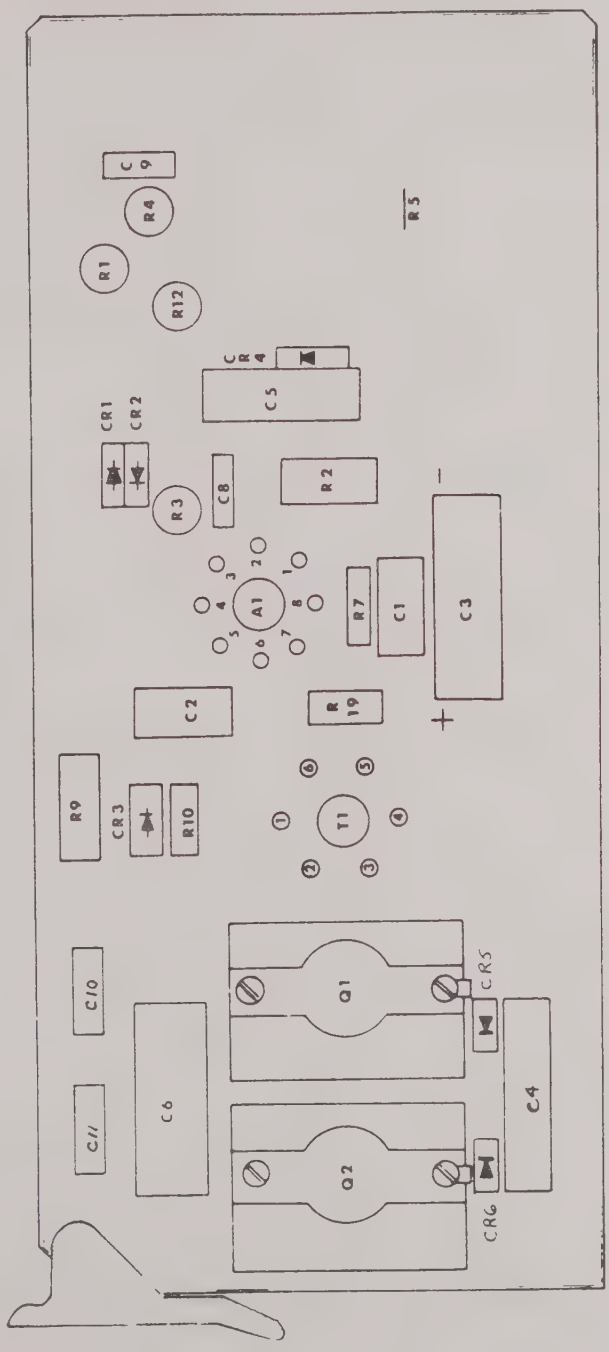


Figure 7-6. GW Servo Amplifier Schematic & Parts Location (Cont'd.)

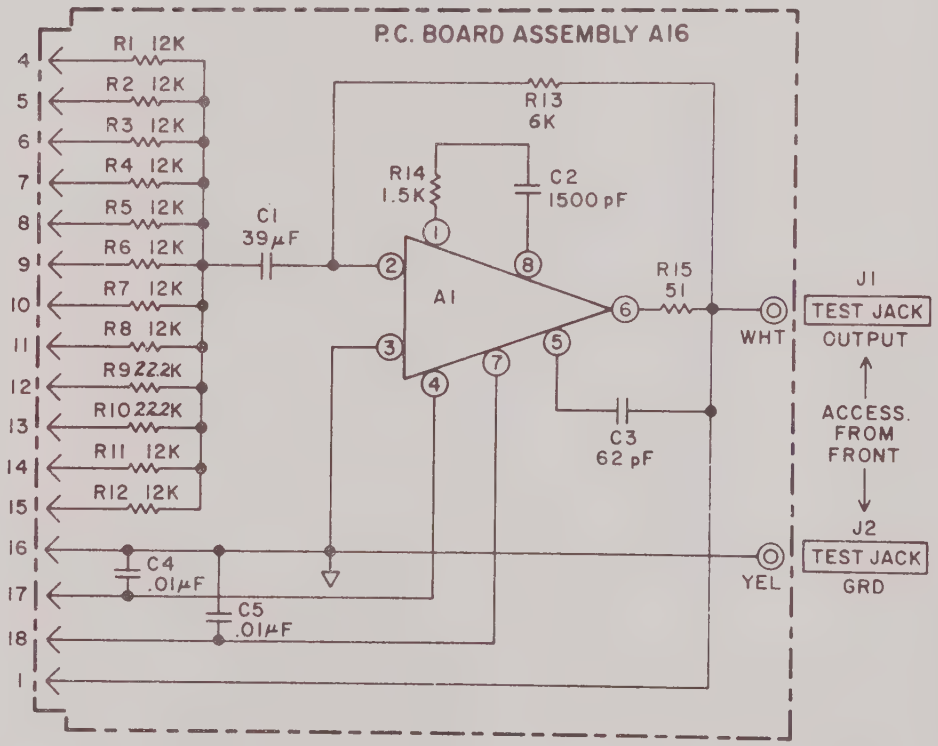


Figure 7-7. Summing Amplifier Schematic & Parts Location

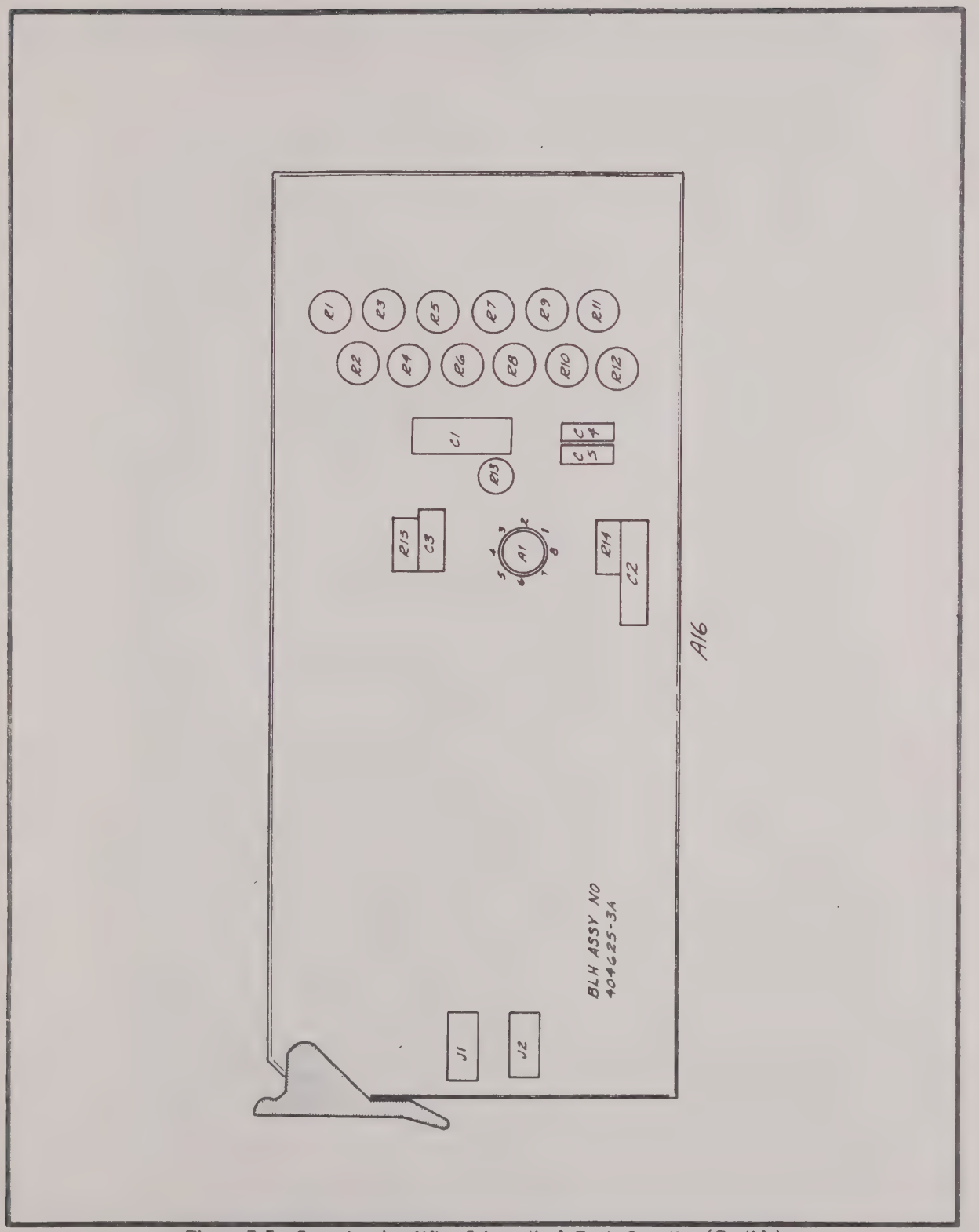


Figure 7-7. Summing Amplifier Schematic & Parts Location (Cont'd.)

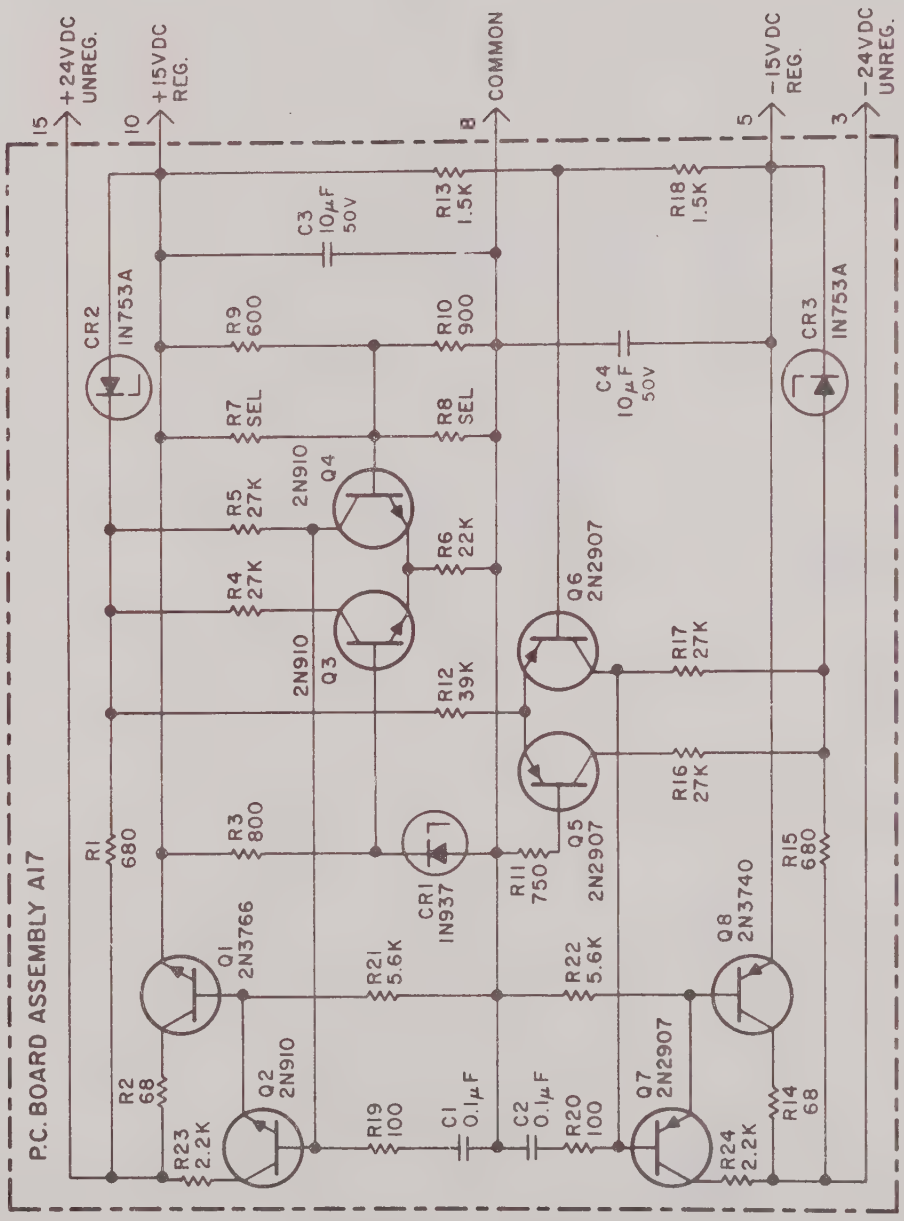


Figure 7-8. Regulated Power Supply Schematic & Parts Location

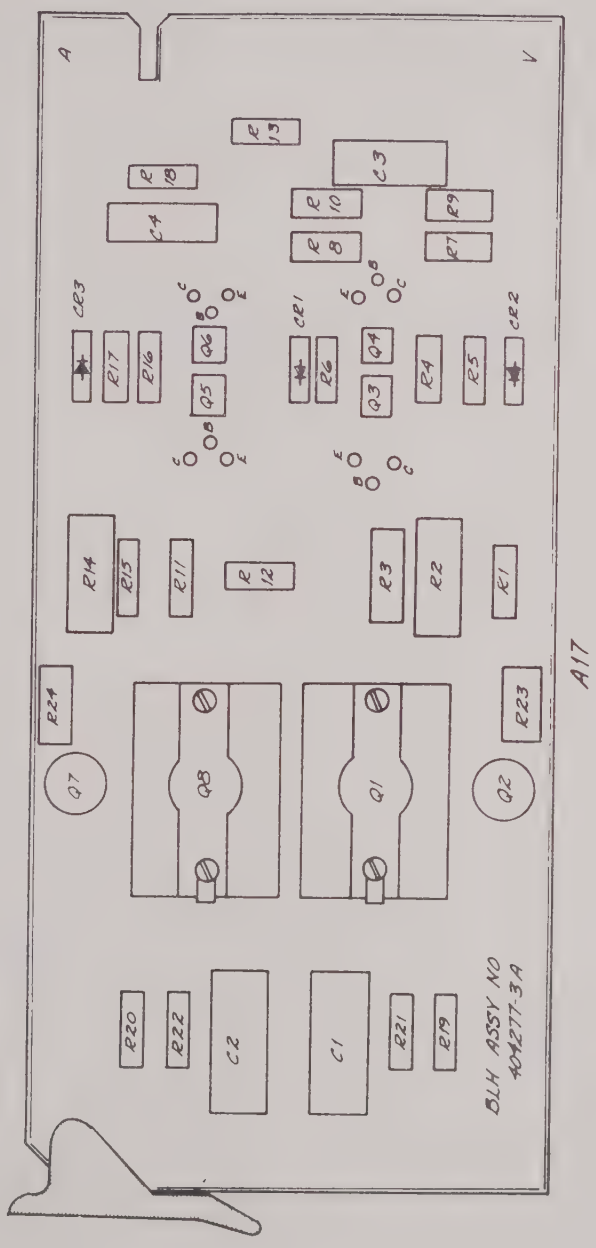
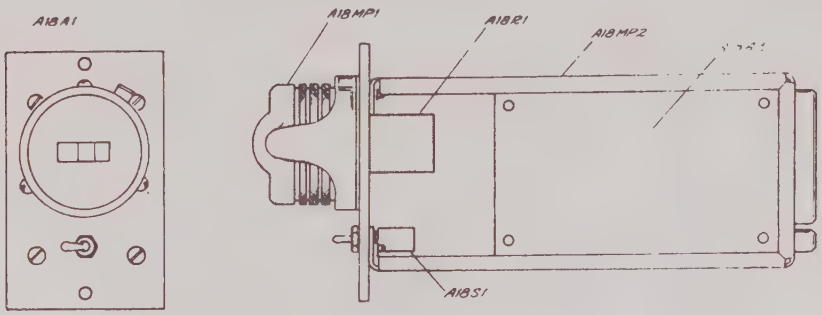
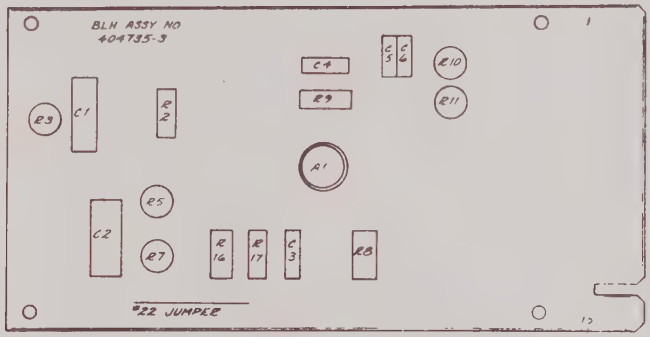


Figure 7-8. Regulated Power Supply Schematic & Parts Location (Cont'd.)





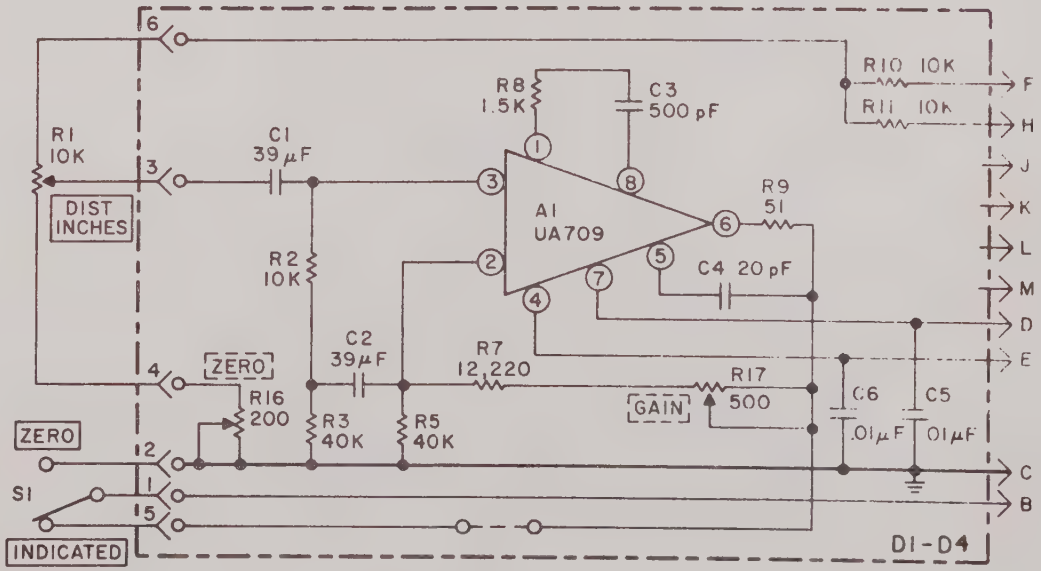


Figure 7-9. Distance Amplifier Schematic & Parts Location

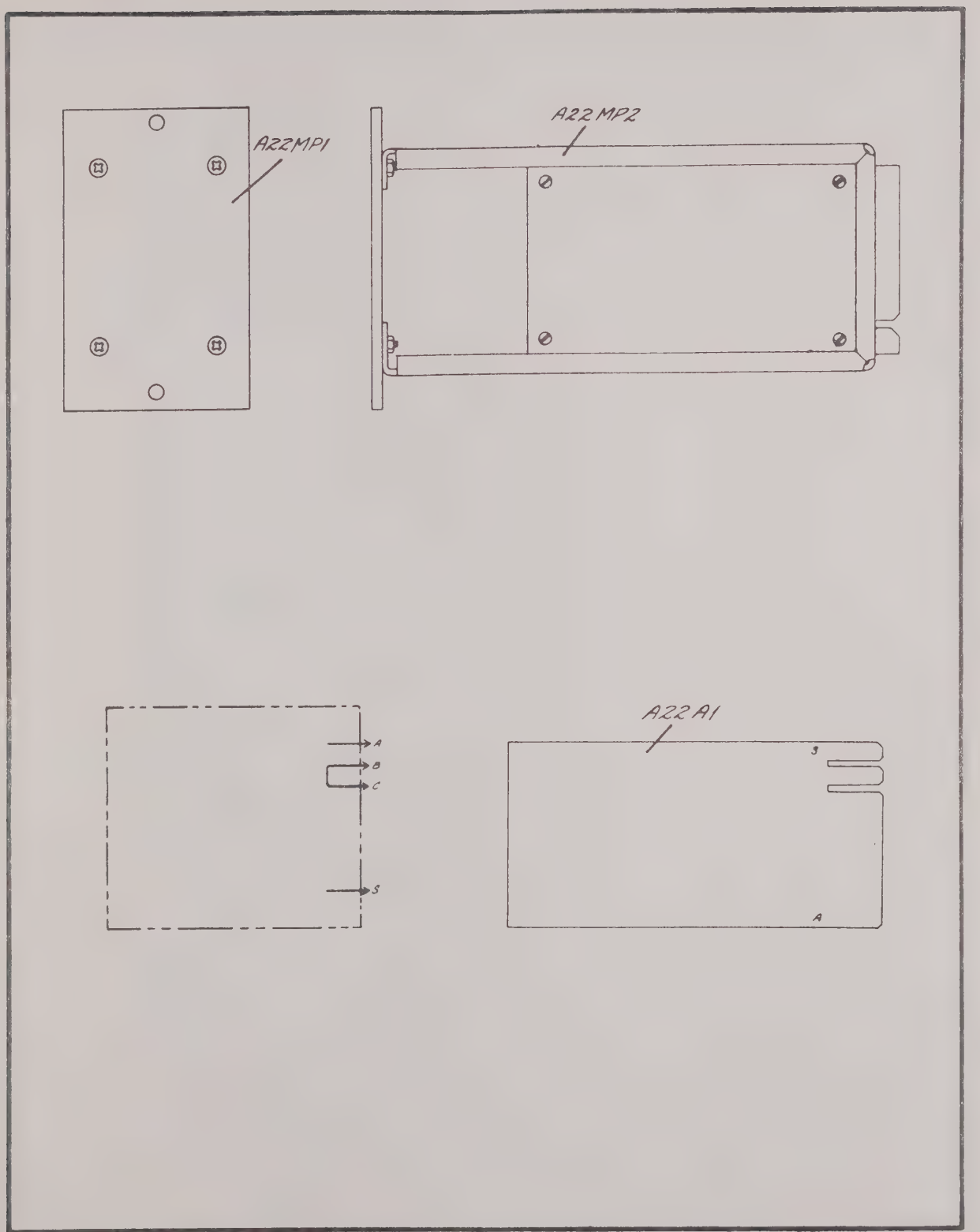


Figure 7-10. Dummy Distance Amplifier Schematic & Parts Location

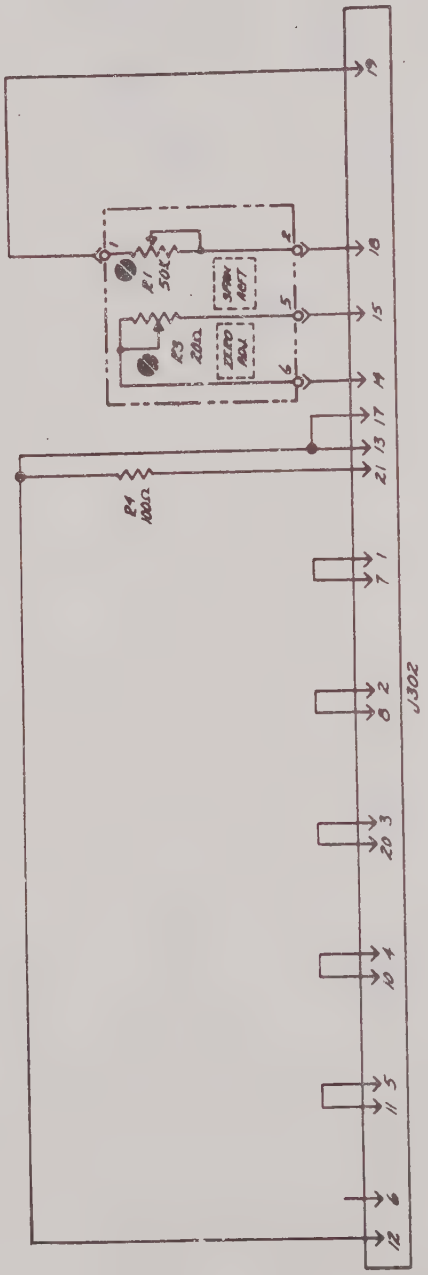


Figure 7-11. CG Indicator Schematic & Parts Location

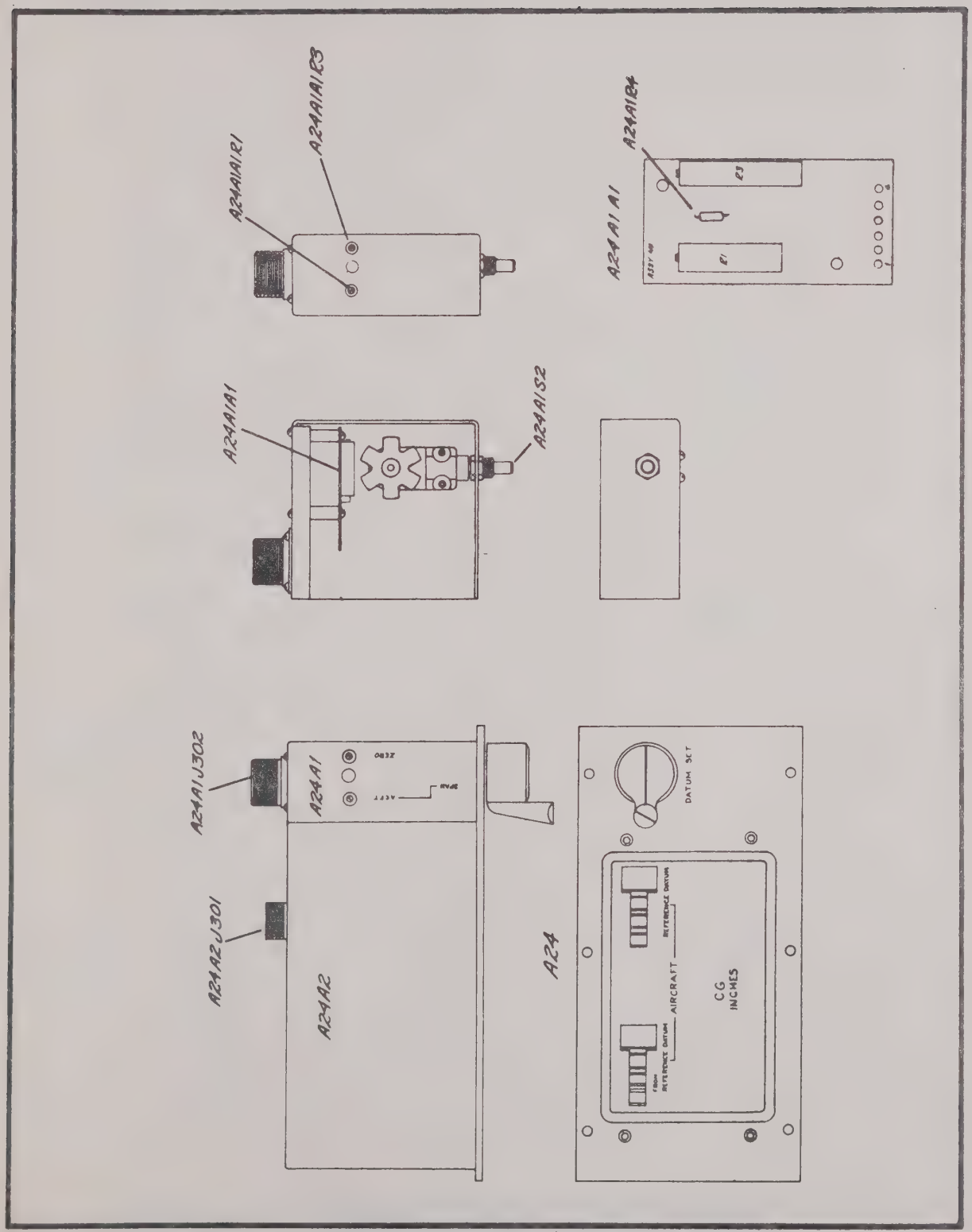
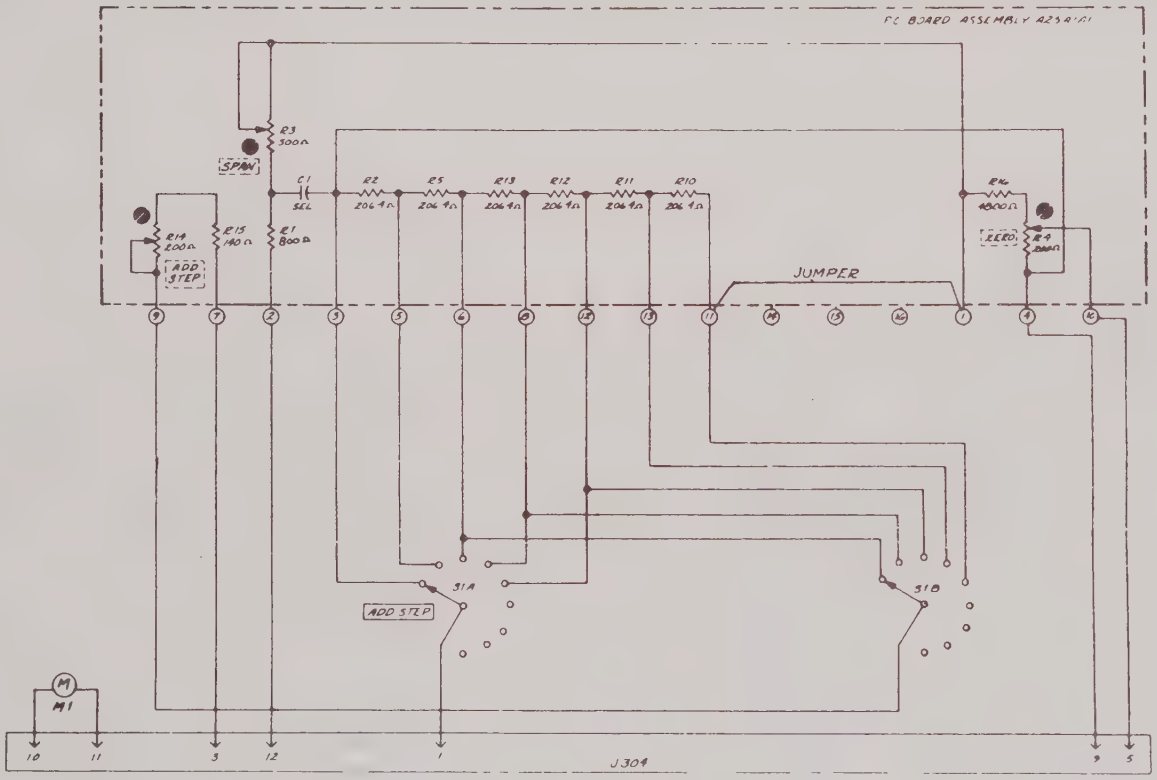
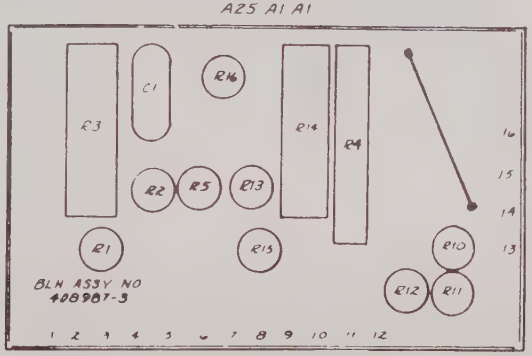


Figure 7-11. CG Indicator Schematic & Parts Location (Cont'd.)





J304 MATES WITH PLUG P304

Figure 7-12. GW Indicator Schematic & Parts Location

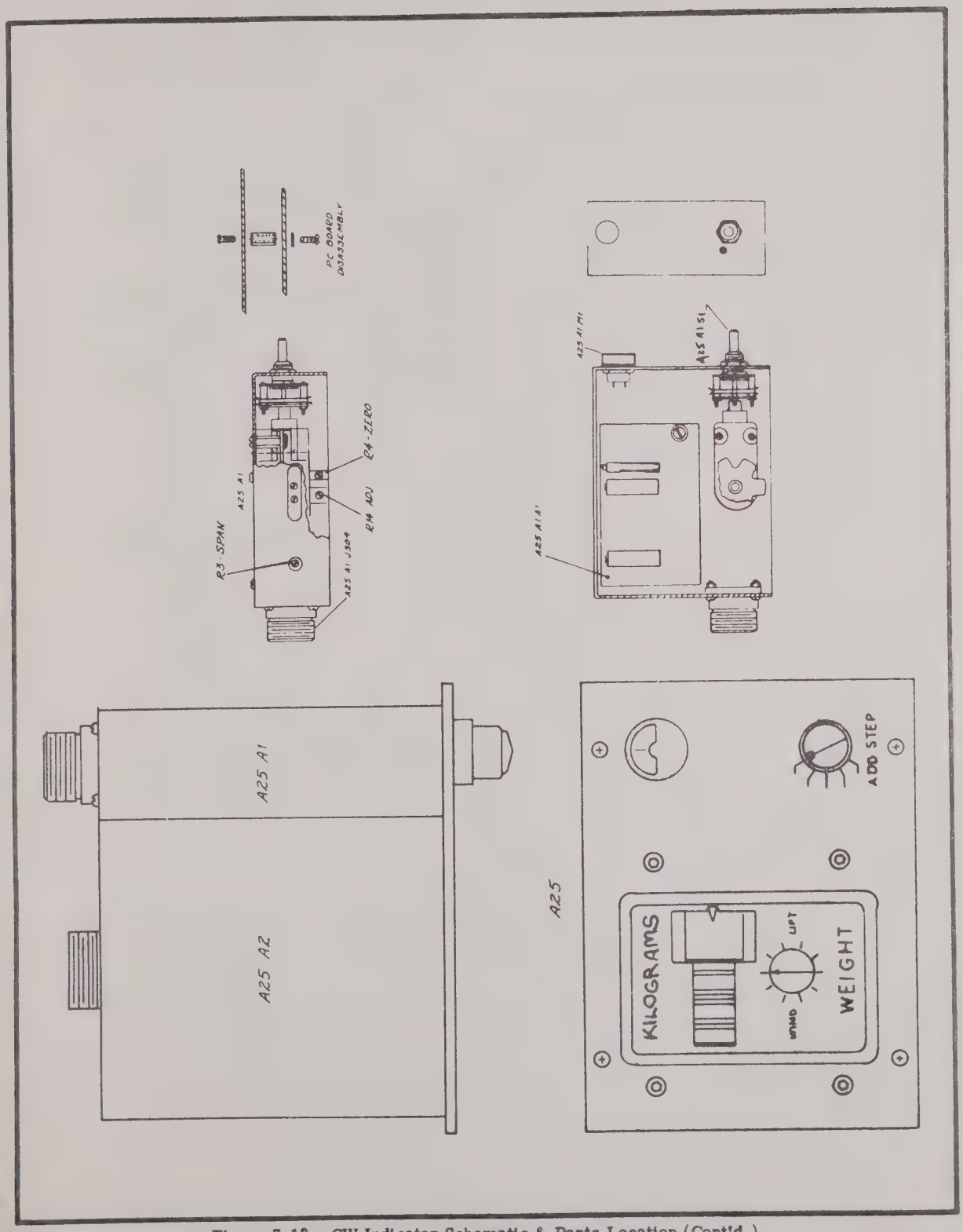


Figure 7-12. GW Indicator Schematic & Parts Location (Cont'd.)

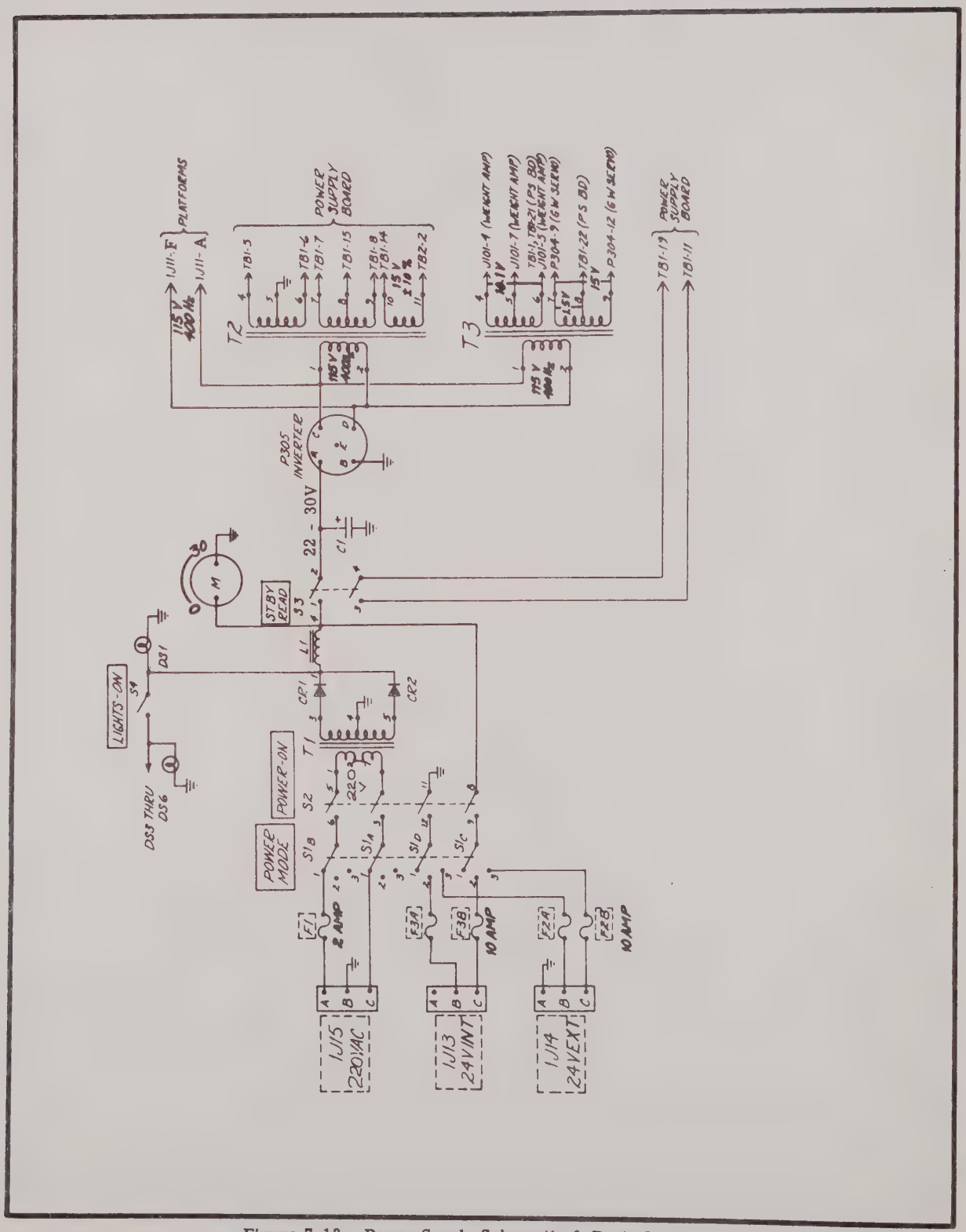


Figure 7-13. Power Supply Schematic & Parts Location

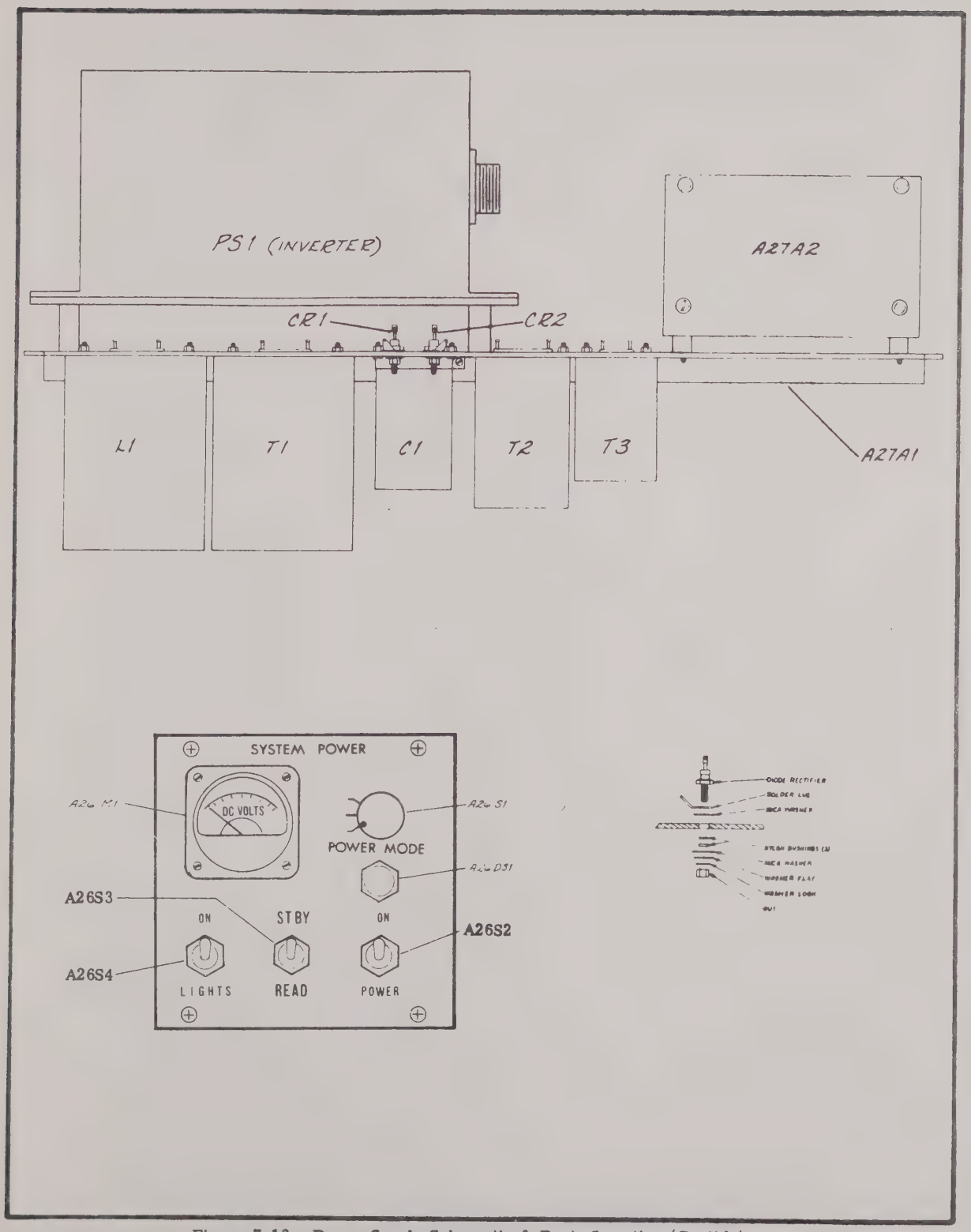
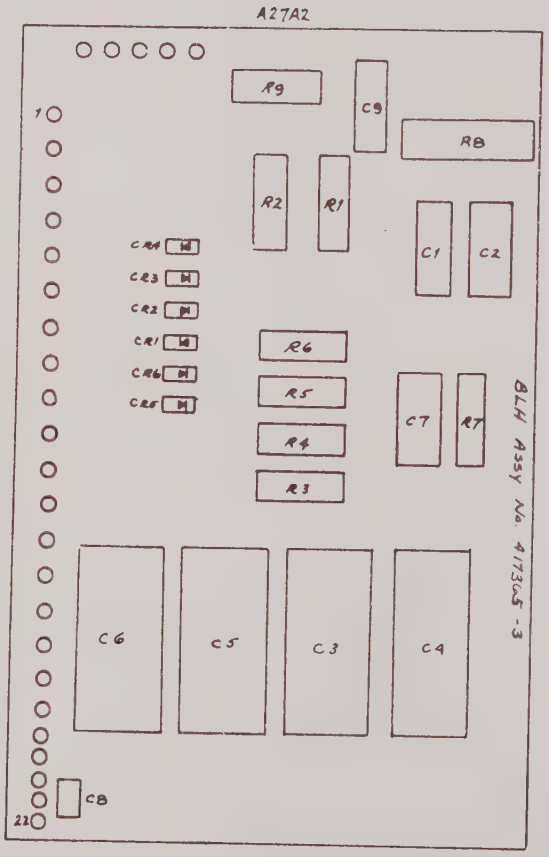


Figure 7-13. Power Supply Schematic & Parts Location (Cont'd.)



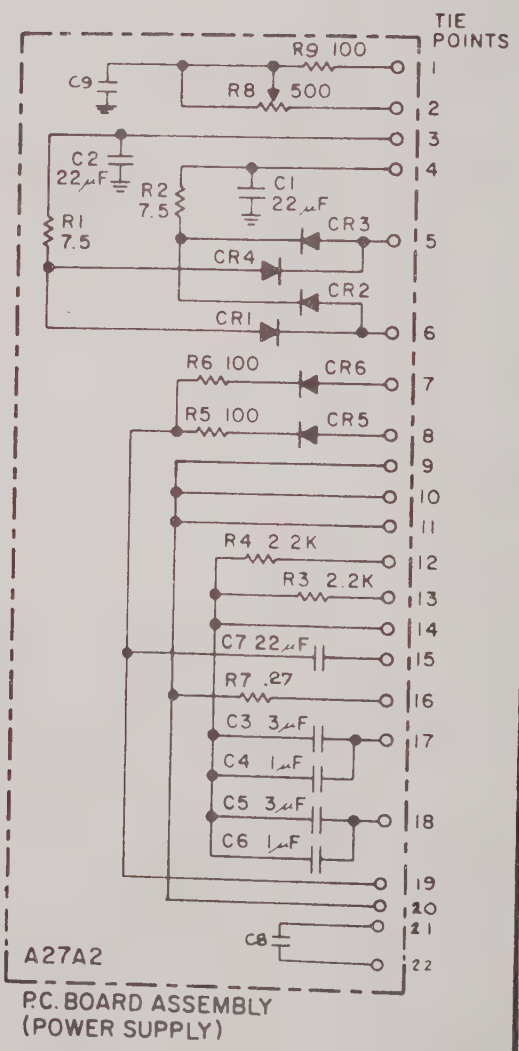


Figure 7-13. Power Supply Schematic & Parts Location (Cont'd.)

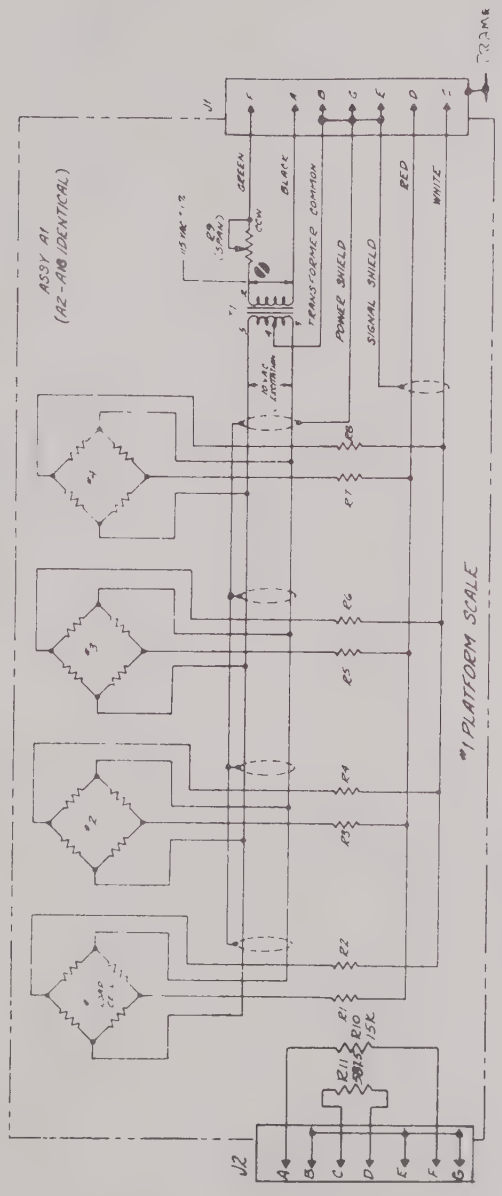


Figure 7-14. Platform Scale Schematic & Parts Location

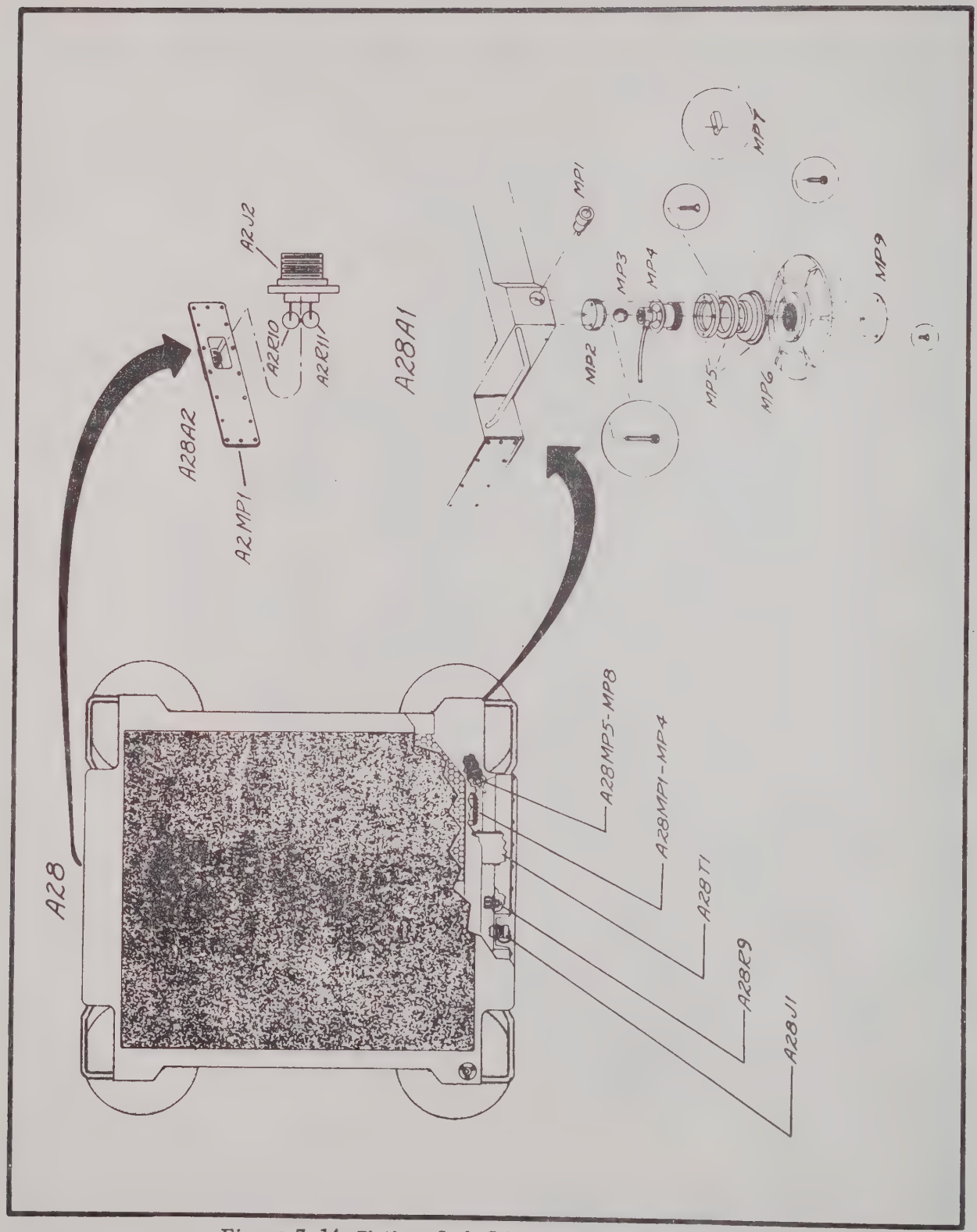
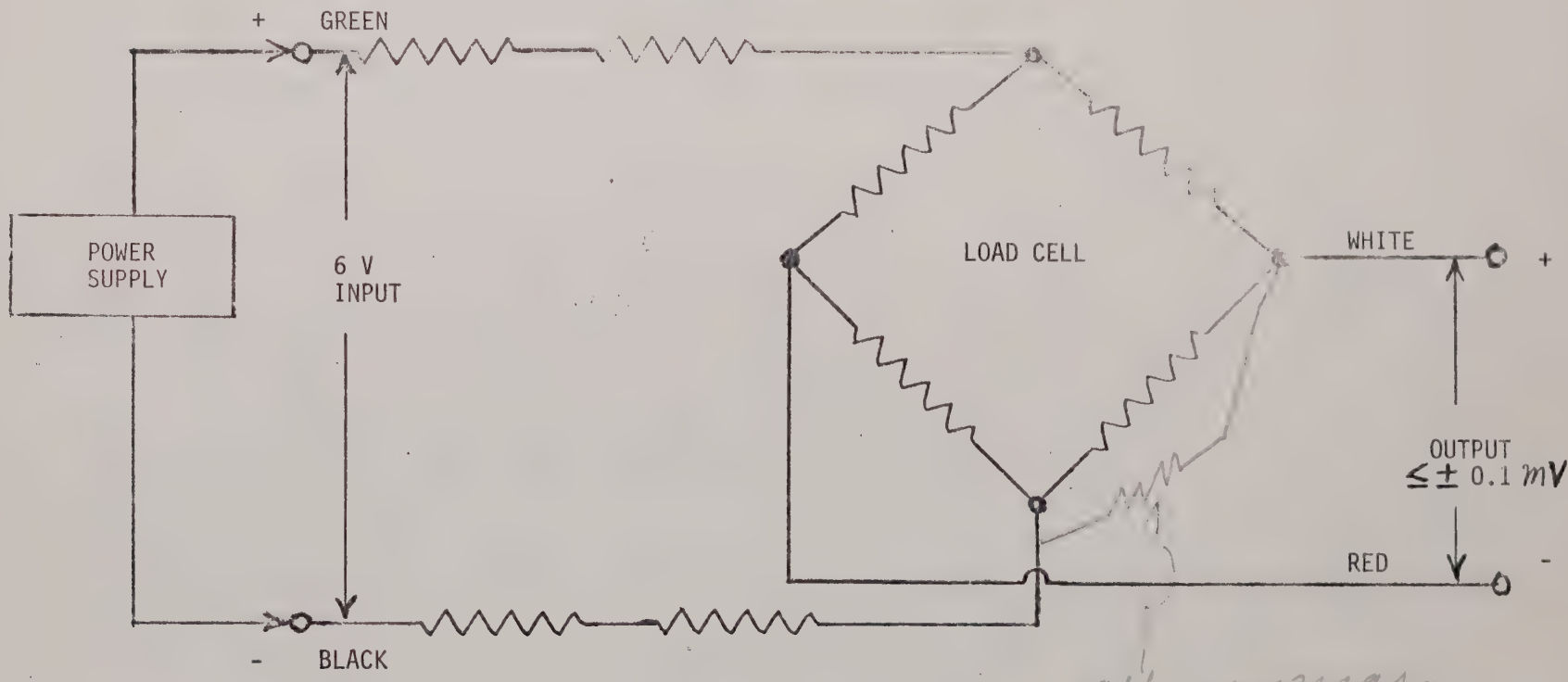


Figure 7-14. Platform Scale Schematic & Parts Location (con'd)

PROPERTY OF DEPT. C-270
METROLOGY LAB.
DO NOT REMOVE
FROM AREA

BLH PLATFORM LOAD CELL TEST

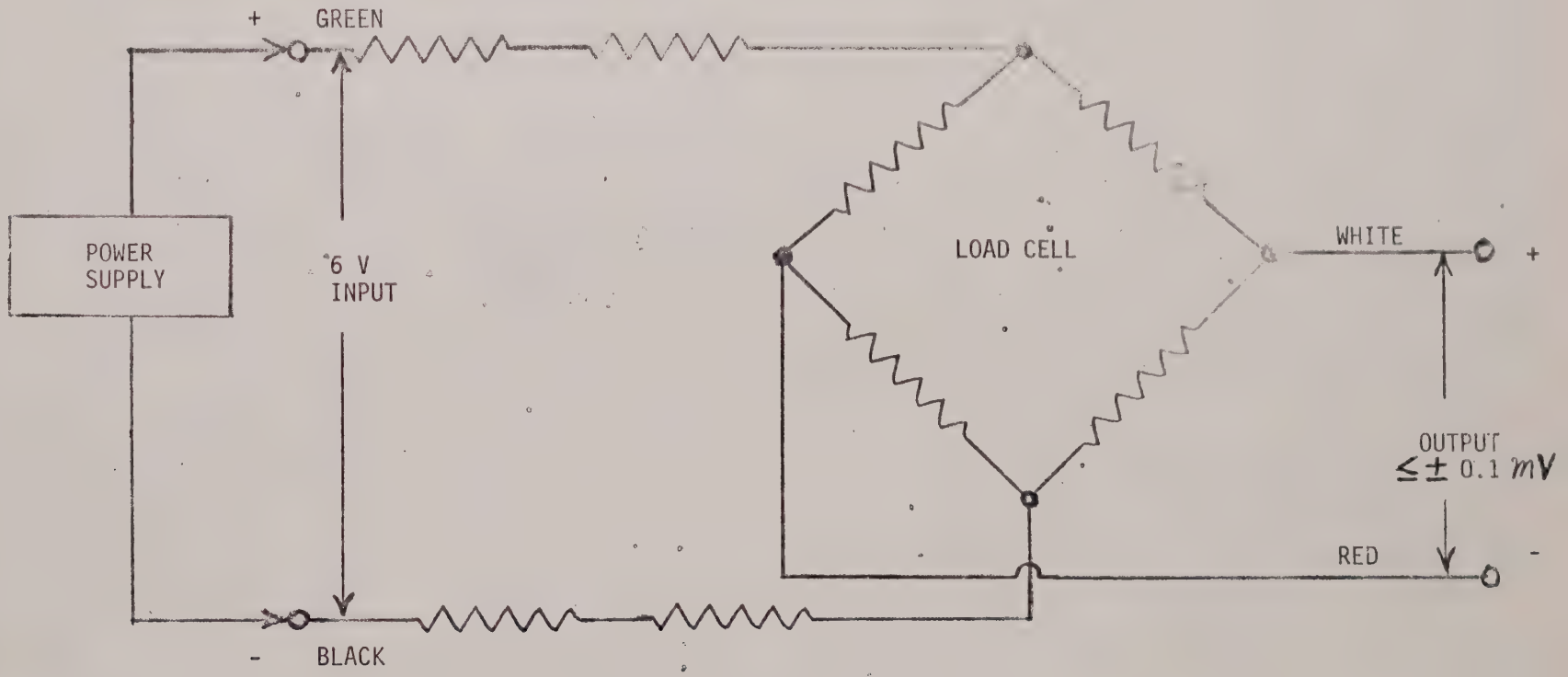
DISCONNECT THE GREEN, RED, AND WHITE LEADS OF THE LOAD CELL CABLE FROM THE PLATFORM WIRING. CONNECT THE EQUIPMENT AS SHOWN IN THE FIGURE BELOW. ADJUST THE POWER SUPPLY FOR 6.00 V.D.C., AND MEASURE THE BRIDGE OUTPUT. THE OUTPUT SHOULD BE LESS THAN ± 100 MICROVOLTS.



add necessary resistor when above test fail.

BLH PLATFORM LOAD CELL TEST

DISCONNECT THE GREEN, RED, AND WHITE LEADS OF THE LOAD CELL CABLE FROM THE PLATFORM WIRING. CONNECT THE EQUIPMENT AS SHOWN IN THE FIGURE BELOW. ADJUST THE POWER SUPPLY FOR 6.00 V.D.C., AND MEASURE THE BRIDGE OUTPUT. THE OUTPUT SHOULD BE LESS THAN ± 100 MICROVOLTS.



5-38. TROUBLESHOOTING.

5-39. General.

5-40. The basic tools for troubleshooting the System are the schematics in Section VII, theory information in Section IV, and the performance checks and adjustments in this section. However, before attempting any repairs the technician should acquire all possible information regarding the complaint.

5-41. To locate trouble in the System start with a thorough visual inspection and then proceed with the electrical check as necessary. During the visual inspection look for loose components, loose or improper connections, blown fuses, abnormal indications on meter or digital readout. Check that switches and dials have been set to the proper position. Check for odors of burned insulation, charred resistors, over-heated transformers, etc. Repair any defect discovered during the visual inspection and check instrument performance before continuing troubleshooting.

5-42. The Troubleshooting Tree in Figure 5-5 is designed to aid in locating and correcting problems in the System. The Self-Check process operates to generate internal signals which are then tracked through the instrument. If problems exist the Self-Check separates the input devices from the instrument. If the Self-Check is successful any problems existing must occur before the input of the Weight Amplifier.

5-43. Self-Check.

5-44. When a malfunction is suspected, attempt the Self-Check process, page 3-3. If the instrument self-checks properly, check that all inputs are within System Specifications. Damaged connecting cables may be causing noise or intermittent connections. If malfunction still occurs (fails Self-Check), cause is internal to the instrument. Review the performance to help determine the source of trouble.

5-45. Substitution.

5-46. Troubleshooting is greatly simplified if checking is done by replacing assembly that is suspected of malfunction with spare assembly known to be operating correctly. This can be done effectively with the platform scales, cables weight amplifiers, and distance amplifiers. If the power source is defective as indicated by the panel meter, select another source, if practicable. All voltage points are readily accessible for checking through the rear upper panel of the System. When the malfunctioning assembly is found, trouble can then be traced to individual components responsible for the malfunction, or replaced intact by a new assembly.

5-47. Platform Check.

5-48. If the instrument self-checks properly, then the connecting cables and platform should be checked for defects. Table 5-2 and Table 5-3 list the leakage resistances and ohmmic resistances between the live (not dummy) connector pins and between connector pins and the platform scale metal frame. Resistance values specified in the tables are for one platform only with no connection made to the dummy connector or to a second platform. The resistance values in the tables are approximations and are useful only as a troubleshooting aid in conjunction with the schematic on page 7-25.

5-49 Measurements can be made with megohm bridge, megohmmeter, insulation resistance test set, or other suitable test equipment. Voltage applied by the test equipment should not exceed 50Vdc for the leakage tests, and 10Vdc for resistance measurements.

CAUTION: Do not use greater than 10Vdc for resistance measuring because of the danger of damaging the platform transformer or load cell gages.

5-50. When checking leakage, make measurements first at the instrument end of the cable using Table 5-2. If the measurements indicate a defect, then disconnect the cable from the platform and then check the platform connector using Table 5-3. If the platform checks correctly, then the cable can be assumed to be faulty and should be checked.

5-51. Since leakage resistance measured will be a function of moisture, both in the air and around the connector pins, it is suggested that the connectors be carefully examined for condensation and for foreign matter between pins and shell and between pins before rejecting the platform or cable as defective.

Table 5-2. Platform Cable Check List

Measure From	To	Max Volts	Approx Resistance
Pin G	Platform Frame	Optional	0Ω
Pin D	Pin C	10Vdc	587.5Ω
Pin F	Pin A	10Vdc	25 - 525*
Pin F	Pin G	50Vdc	100MΩ
Pin F	Pin D	50Vdc	100MΩ
Pin A	Pin G	50Vdc	100MΩ
Pin D	Pin G	50Vdc	100MΩ
Pin C	Pin G	50Vdc	100MΩ
Pin B	Pin G	Optional	0Ω

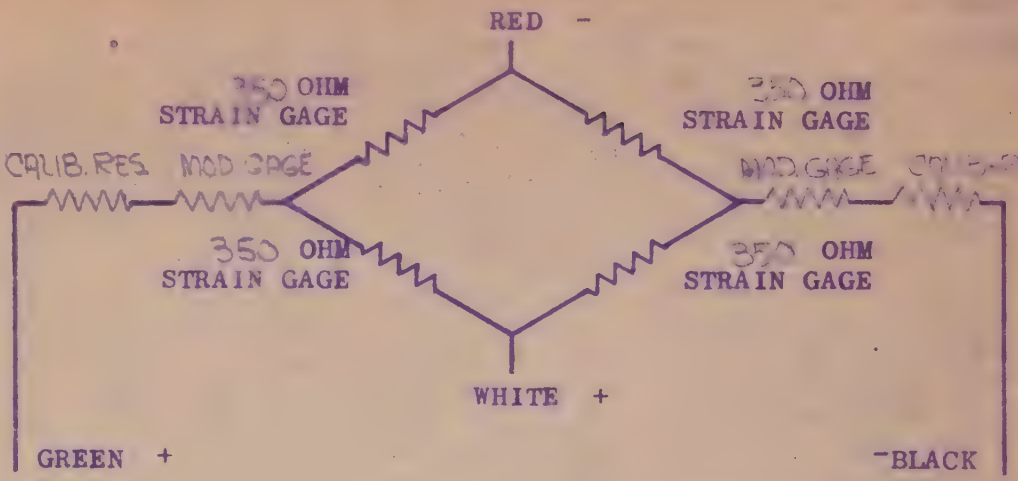
*Depending upon span setting

Table 5-3. Platform Check List

Measure From	To	Max Volts	Approx Resistance
J1 Pin F	Platform Frame	50Vdc	100MΩ
J1 Pin A	Platform Frame	50Vdc	100MΩ
J1 Pin D	Platform Frame	50Vdc	100MΩ
J1 Pin C	Platform Frame	50Vdc	100MΩ
J1 Pin B	Platform Frame	50Vdc	100MΩ
J1 Pin G	Platform Frame	50Vdc	100MΩ
J1 Pin E	Platform Frame	50Vdc	100MΩ
J1 Pin D	J1 Pin C	10Vdc	587.5Ω
J1 Pin F	J1 Pin A	10Vdc	25 - 525Ω*

*depending upon span setting

KUP	CHANGE IN OPEN CIRCUIT OUTPUT VOLTAGE FOR RATED CAPACITY	OUTPUT VOLTAGE AT ZERO LOAD
TYPE MWP LOAD CELL 250 Lb, 1250 Lb, 2500 Lb	1.5 ±.0015 MV/V INPUT (A)	NOT OVER 0.015 MV/V INPUT
TYPE MWP LOAD CELL 2.5 KILO 5K Lbs	2 000±.002 MV/V INPUT	NOT OVER 0.020 MV/V INPUT
	± MV/V INPUT	NOT OVER MV/V INPUT



GENERAL NOTES

1. MOD. GAGE VARIES WITH TEMPERATURE TO COMPENSATE FOR THERMOELASTIC COEFFICIENT OF PICKUP METAL
2. (A) RECOMMENDED INPUT 10 VOLTS AC OR DC. MAX. INPUT 15 AC OR DC
3. POLARITY IS SHOWN FOR :

   COMPRESSIVE LOAD, POSITIVE PRESSURE OR CLOCKWISE TORQUE.

(C) (B) (D) INPUT - BLACK TO GREEN - RESISTANCE 370 MIN OHMS AT 70°F

INCREASES 7 OHM FOR 100°F RISE

OUTPUT - RED TO WHITE - RESISTANCE 350 ± 3.5 OHMS AT 70°F

REVISIONS			
A	REVISED PER ECN 12577 WM 1-8-68		
B	ECN 19957 MHE 2/21/79		
C	ECN 20530 JP 1/14/79		
D	ECN 21054 RBG 9/27/79		
E			

9/1/67 DRAWN D.R. MANOOGIAN

CHECKED 9-1-67

APPROVED

RELEASED

E R W

SCALE

BALDWIN-LIMA-HAMILTON CORP.
ELECTRONICS DIVISION
WALTHAM 54, MASSACHUSETTS

BRIDGE SCHEMATIC
Nominal Resistance 350 Ohms
Constant Voltage

404857 — 1 E

9-24-80

when the (MRUX) comes back in for its 2nd Calibration:

Reset all amplifiers "CHK CAL" values for the original placard values (PCB pot adjust on each amplifier)

Now, load up each platform and for Span adjustment, remove ~~from~~ side panel on the platform and adjust the pot there for agreement with the known applied load.

original values

CHL	1	40040	CHL	7	40020
	2	39840		8	40060
	3	39,980		9	40020
	4	39990		10	40020
	5	39980		11	40000
↓	6	39920	↓	12	40000

ADJUSTMENTS

BASIC SYSTEM ZERO

SET ALL WEIGHT AMPLIFIER MODULE ON-OFF SWITCHES TO OFF.

HOLD THE STBY-READ SWITCH TO READ.

THE GROSS WEIGHT SERVO READOUT SHOULD INDICATE 00,000. IF NOT, REMOVE THE GROSS WEIGHT SERVO READOUT MODULE AND PERFORM A ZEROING ADJUSTMENT WITH THE ZERO POTENTIOMETER. NOTE: DO NOT DISTURB ANY OTHER ADJUSTMENT HERE!

CHECK CALIBRATION (CHK CAL)

SET ALL WEIGHT AMPLIFIERS TO CHK CAL AND ON-OFF SWITCHES TO OFF, EXCEPT FOR THAT CHANNEL UNDER TEST, WHICH IS ON.

NOTE: PLATFORM SCALES ARE NOT REQUIRED TO BE CONNECTED TO THE INDICATING INSTRUMENT MODULE FOR THE FUNCTIONS: CHK ZERO AND CHK CAL.

ACTUATE THE STBY-READ SWITCH TO READ.

THE GROSS WEIGHT SERVO READOUT SHOULD INDICATE THE PLACARD VALUE FOR THAT CHANNEL. IF NOT, REMOVE THE WEIGHT AMPLIFIER MODULE AND MAKE A SLIGHT ADJUSTMENT OF THE ONE POTENTIOMETER ON THE PC BOARD. THEN REPEAT THE ABOVE TO CHECK THE ADJUSTMENT.

FULL SCALE SPAN ADJUSTMENT

PERFORM ALL UUT SELF-CHECKS. SET THE WEIGHT AMPLIFIER TO OPR.

APPLY FULL RATED LOAD (NOT PROOF LOAD). SPAN ADJUSTMENT IS MADE WITH THE POTENTIOMETER UNDER THE SIDE-PLATE OF THE PLATFORM SCALE.

PRESSBOARD BINDER

GENUINE TYPE 1 PRESSBOARD

STOCK NO. R118